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### THESIS

**ANALYSIS OF A 3-TIER DISTRIBUTED  
ARCHITECTURE FOR THE SECTOR ANTI AIR  
WARFARE CENTER**

by

Matthew P. Howell

September 1997

Thesis Advisor:  
Associate Advisors:

Luqi  
Mantak Shing  
Michael Holden

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**ANALYSIS OF A 3-TIER DISTRIBUTED ARCHITECTURE FOR THE SECTOR  
ANTI AIR WARFARE CENTER**

Matthew Peter Howell  
Captain, United States Marine Corps  
B.A., University of Michigan, 1987

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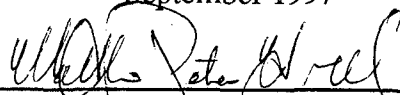
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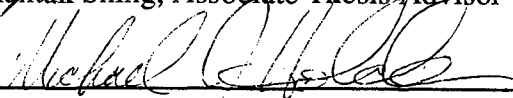
Author: \_\_\_\_\_


  
Matthew Peter Howell

Approved by: \_\_\_\_\_

  
Luqi, Thesis Advisor

  
Mantak Shing, Associate Thesis Advisor

  
Michael Holden, Associate Thesis Advisor

  
Ted Lewis, Chairman  
Department of Computer Science





## ABSTRACT

The Marine Air Command and Control System (MACCS) is composed of a collection of legacy, stovepipe Automated Information Systems (AIS), each of which contain functionality which is widely duplicated throughout the MACCS. A proposed alternative architecture, the Common Air Command Control System (CAC2S), would leverage the investment currently being made in Command, Control, Communications, Computing, and Intelligence (C4I) systems which provide a robust set of functional services common to a wide range of mission critical applications. A plan for migration from the MACCS architecture to the CAC2S architecture is a required component for a successful transition.

This thesis describes the messaging and database methodology, the ongoing efforts to identify common data types and processes, and a proposed three-tier distributed object architecture, which will guide the MACCS migration to the CAC2S. A Software Engineering tool, the Naval Postgraduate School Computer Aided Prototyping System (CAPS), is used to model a component of the MACCS, the Sector Anti Air Warfare Center (SAAWC), in an effort to more precisely identify the critical data type representations and data processing requirements needed to properly specify the CAC2S.

As a result of this effort, a blueprint has been created to describe the methodology and analysis required to effect the migration from the MACCS architecture to the CAC2S vision.



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## **I. INTRODUCTION**

### **A. BACKGROUND**

The Marine Air Command and Control System (MACCS) is composed of agencies, equipment, and the operating procedures required to provide the Aviation Combat Element (ACE) commander with the means to command, coordinate, and control all air operations within an assigned sector, and to coordinate those air operations with other Services operating in the battlespace. Recognizing the need to migrate from the current dissimilar, or "stovepipe", command and control (C2) systems prevalent in the MACCS to an open architecture which is compliant with the Department of Defense Information Infrastructure Common Operating Environment (DII COE), the Marine Corps has endorsed a Common Aviation Command and Control System (CAC2S) concept as a target system architecture. The CAC2S will be required to provide the automated aviation planning, situational awareness, decision aid, and execution tools currently available to MACCS operators, but to do so within an architecture which takes full advantage of the common messaging, database, network, security, and display services provided by a DII COE compliant Command, Control, Communications, Computers, Intelligence (C4I) Workstation.

### **B. MOTIVATION**

The MACCS incorporates sensors, controls, weapon systems, and the agencies which employ these tools to accomplish their doctrinal missions. Common networks within the MACCS include a number of DOD standard datalink networks and air

command and control voice communications networks, all of which contribute to the development of a common Battlefield Awareness (BA) for a particular air/ground sector. Previous and current upgrades to the MACCS architecture have consisted of the incremental upgrading of MACCS components, primarily special purpose processors, display devices, and communications equipment. These components are required to meet a limited set of data and programming interface standards in order to ensure continuing interoperability. This development and fielding methodology has populated the MACCS inventory with a number of special purpose devices which are functionally sufficient for completing the MACCS mission, but are expensive to develop, procure, operate and maintain. Additionally, the common BA developed among MACCS operators working in the current architecture is constrained by the need to employ multiple "boxes" on the desktop, essentially "stovepipe" systems, each with a limited capacity for sharing critical battlespace information with other systems. Finally, MACCS operators must struggle in the current architecture to overcome the inefficiencies introduced by having to perform separate but related tasks in a number of different operating environments.

Traditional interpretations of the purpose of the MACCS focus on the goal of providing a Common Operational Picture (COP) of the Air Battlefield to the MACCS operator. This operator could be responsible for launching Homing All The Way Killer (HAWK) missiles, controlling aircraft as they transit certain air sectors, or preparing the Air Tasking Order (ATO) for the next day's sorties. The principal means for building this COP, as a means to developing superior BA, has been through the processing of

electronic contacts, both passive and active, into tracks, which are then assembled into a "track file." This track file is then distributed to terminals throughout the MACCS and to similar air operations and control centers in the other Services. Migration to a CAC2S architecture, which will use not only traditional sources of information to build BA, but also electronically generated mail, United States Message Text Format (USMTF) messages, and archived intelligence records, requires the development of a new concept. Such a concept could be envisioned as a virtual state machine, which builds BA through the rapid processing, correlation, storage, and retrieval of Air Battlefield information developed from both tactical and national resources. Each CAC2S terminal in turn will be a specific instance of this state machine, an instance which captures that portion of the Air Battlefield pertinent to that CAC2S operator's tasks.

Though many components of the MACCS, such as the HAWK missile system and the AN/TPS-59 radar system, will continue to be developed as special purpose computing systems, much of the functionality within the MACCS is specified for the development of superior BA to provide an environment in which the most efficient decisions with the greatest likelihood for success in the battlespace can be made. That is, a great majority of the tasks required of MACCS operators specify the receipt, processing, and analysis of information in order to implement decisions which effect the employment of plans, equipment, and personnel. In examining the migration of the MACCS to the CAC2S it is necessary to distinguish the components of the MACCS which sense and destroy enemy objects, such as the AN/TPS-59 radar and the HAWK missile systems, from those which

support the decision-making process. Once this distinction has been made, it will become possible to permit the design of an architecture which supports the vertical development of special purpose sensors and weapon systems in conjunction with the horizontal development of a general purpose information systems network which best supports the development of the MACCS operator's BA. The migration plan must recognize that the computing problems associated with sensors and weapon systems are different from the computing problems associated with decision-making tools and aids. The latter problems are well-researched, well-documented, and have solutions which are widely implemented in the commercial world. Moreover, within the DOD there is a tremendous amount of effort currently being devoted to the formulation of a definition of such a general purpose information systems architecture.

One of the principle benefits of military computing in the information age is to bring coherency to the COP. The introduction of DII COE Workstations and, in particular, the Maritime variant of the Global Command and Control System (GCCS), the Joint Maritime Command Information System (JMCIS), promises to bring to the MACCS common messages, data types, network communication protocols, display technology, security, administration, and database services. Implementation of these standards will significantly enhance the common BA of operators throughout the MACCS, as well as significantly decrease the costs associated with developing, procuring, fielding, maintaining, and training operators on new MACCS components. If perfect BA is the Holy Grail of the warfighter, and computing is certainly integral to that goal, then

common, sophisticated messaging and database technology must be the cornerstone of efforts to migrate legacy computing systems. The MACCS is an ideal candidate for the mapping of that migration path.

There are two clearly identifiable revolutions in military computing: the first revolution involved the realization that computing could be used to create abstractions of real-world concepts, and to manipulate those abstractions in ways which provided meaning and intelligence to the operator trying to understand the state of the battlefield. This revolution was realized on special-purpose, embedded systems hardware, and represented a coherent "system-engineering" approach to the specification, design, and implementation of these machines and networks. Examples of these manifestations of special-purpose systems surround us today in the military: the Tactical Digital Link (TADIL) processors with their associated display subsystems and communication equipment; the Automated Digital Network (AUTODIN) switching centers with their associated processing, display, and communication subsystems; the Tactical Receive Equipment (TREs) with their associated processing, communication, and cryptographic subsystems.

The second revolution in military computing, and the one in which we currently find ourselves, came about with the invention and rapid adoption of some key computing technology and protocols: the tremendously powerful and inexpensive microprocessor with its associated peripheral devices; and Transport Control Protocol/Internet Protocol (TCP/IP), a widely adopted set of internetworking protocols which transcends proprietary



network protocols, allowing heterogeneous computers to communicate and truly distribute processing in powerful ways. The first factor in particular forced computer scientists to focus less on "system engineering" and more on "software engineering." They discovered that computing machines and computing networks were rapidly entering the realm of commodities. General purpose computers and networks became so powerful and inexpensive that software engineers were forced to modularize their computing abstractions to take advantage of computing architectures, rather than computing systems.

Three trends have accelerated the movement to implement the computing systems of the first revolution within the computing architecture of the second revolution: decreasing amounts of money, increasing redundancy in written program source code, and decreasing complexity in administering systems. General purpose computers and networks powerful enough to manage and manipulate the computing abstractions of our mission critical computing systems are widely available in the commercial sector, and inexpensive enough to motivate the move away from many special-purpose embedded systems. Moreover, the software programs and processes required to meet the needs of many of our mission critical functions, such as messaging, financial management, and logistical operations, are increasingly available as well in the commercial sector.

The redundancy issue involves the tremendous amount of time and money invested in creating and maintaining the same computing algorithms, data sets, and objects over and over again throughout organizations and industries. Recognizing the expense of a typical line of code, which drives the need to craft reusable code modules with

well-designed interfaces, has forced software developers inside and outside of the DOD to focus on identifying the functionality and required data sets of the target domain, in order to enable the search for, and acquisition of, existing computing abstractions at a significant savings over traditional in-house custom-built computing solutions.

Finally, the trend toward decreasing complexity is one in which the complexity of the computer system, manifested in such computing domain concepts as network administration, runtime environment configuration, and peripheral device installation and management, without knowledge of which computing systems cannot be properly administered and maintained, is evolving toward increasing abstraction of these computing domain principles and mechanisms. This trend frees the user to focus on the missions and tasks for which he or she is trained, rather than on mastering the techniques and methods of operation created by software developers to facilitate the tasks and operations associated with the development of software systems.

The proceeding discussion is meant to illustrate the following point: we no longer have either the resources or the incentive to develop special-purpose, embedded computing systems for all but the most unique and time-critical of our computational needs. And in order to identify the commodity computing machines, networks, and software processes which best fulfill our computational needs, it is critical that we identify that mission essential functionality, and those required data sets, which represent and describe our targeted operational domains. This paper examines the processes and data types which embody the required functionality of the Sector Anti Air Warfare Center

(SAAWC), itself a subsystem containing much of the functionality exhibited in the MACCS. The accurate and thorough specification of the processes and data types within the SAAWC is the critical first step in developing an object-oriented, network-centric, standards-based, relatively inexpensive, BA system which meets the required functionality of the USMC, complies with the standards-based environment of the DII COE, and takes advantage of the key technologies of the second revolution in military computing: virtual machines, commodity computers and TCP/IP-based networks, distributed object computing, and object Relational Database Management Systems (RDBMS).

## **1. Messaging**

Computers are particularly useful for two things: messaging and database operations. Messaging is as old as man himself and often serves as the principle reason behind success or failure on the corporate and military battlefields. Messaging drives decisions, which in turn drive actions. Messaging is the principal means for developing BA. Timely and accurate messaging separates winners and losers, victors and the vanquished. Messages need not themselves be sophisticated: a simple message identifying enemy actions at a particular point and place in time can turn a battle. Message transmission technology need not be sophisticated: a timely phone call, simple e-mail, or faxed image can convey immediate and pertinent information. What requires a concerted and orchestrated effort, however, and a sophisticated analysis and design as a preliminary stage, is the development of a messaging system which defines each message as one of a finite set of Abstract Data Types (ADT): readable, representable, and redistributable to

both humans and computers, and a means for transferring these ADT "objects" rapidly across distinct but interoperable networks.

It is important that a MACCS to CAC2S migration plan recognizes the significance of these ADT "objects", which are both the means by which BA is developed and the means by which tactical, operational, and strategic decisions are implemented. An aircraft "track", an Air Tasking Order (ATO), and an image of an air defense site do in fact have more in common with one another than not. It is critical to the success of the migration plan that the precise computational representations of each of these ADTs be standardized in order to determine the most appropriate means for their transmission, reception and routing.

Furthermore, strong consideration should be given to our representation of abstract events as objects which can exist in a sequence of varying states. For example, an ADT object which was instantiated as a collection of attributes representing a planned air sortie could go through a series of modifications in which the object's own methods modified its state, as a way of indicating the object's transformation from a planned mission, to an executing mission occupying battlespace and battletime, to a finished mission with associated attributes which indicate the consequences of the executed mission. By unifying the conceptual, documented, executing, and historical attributes of a particular event in time, and by encapsulating within the object the methods which can direct the transformation of the object in response to real-world activities, we produce ADTs with properties which facilitate their creation, dissemination, and use within a

distributed messaging system.

To illustrate with another example why deliberate analysis of the messaging process, as it relates to ADTs, is needed, a solution in the CAC2S must be developed to overcome the current limitations in wireless bandwidth which have been exposed in current implementations of the TADIL J processing system. That system has been developed to accomplish the desired refresh rate of the air defense picture through the periodic transmission of the entire battlespace by means of a "track file", providing static position and descriptive information which is associated with each individual track. A more efficient solution uses ADT methods to send messages updating ADT representations when changes to those representations are triggered. Furthermore, by treating the air defense picture as a composition of ADTs, current broadcast, multicast, and subscription messaging methodologies can be implemented to deliver just those ADTs of interest to a particular given user, reducing the amount of traffic over the TADIL J link.

## **2. Database Technology**

Automated Information Systems provide the capability to store extraordinary amounts of data, to index in an extensive and thorough manner, and to retrieve data in powerful ways which will aid BA, problem analysis, and the decision-making process. Traditional hierarchical database methodologies required the database designer to build a database schema with a particular "view", or collection of attributes which composed an entity, in mind. The resulting database schemas purposefully planned for the duplication of database entries in order to account for the many different views different users might

require to the database. Relational database methodologies allow the database designer to build carefully organized relations between distinct, but related entities, allowing for the creation of multiple views into the database schema without the accompanying duplication of database entries.

The MACCS to CAC2S migration plan must include a comprehensive analysis of the data needs of MACCS operators in order to determine the types of information required, the relationships between those information types, and the points and places of replication necessary to permit and enforce the provision of a common BA throughout the MACCS. Efficient design and implementation of relational database technology will support the storage, archiving, and retrieval of perishable, time-critical messaging as well as the provision of encyclopedic data elements or developed information which supports the decision-making process. Relational database technology is the key to efficiently processing and presenting to the user the correct and pertinent COP, amidst the multitude of messages, information, and intelligence which may be available. The migration plan should seek to identify every decision-making point within the MACCS and to develop a plan for incorporating relational database technology into that decision-making process.

#### C. GOAL

There is significant value added in the analysis of data processing requirements and data flow requirements in the MACCS, by modeling the network nodes and links in the SAAWC using the Naval Postgraduate School (NPS) Computer Aided Prototyping System (CAPS). CAPS is used to decompose each of the SAAWC functional

requirements into functional operating nodes, then further decomposing them into common services nodes, and finally, identifying data types and atomic data processing requirements within the resulting nodes and links. The result is an executable model which will facilitate the identification of particular information producing, messaging, and consuming needs and which will suggest a blueprint for the fielding of general purpose C4I Workstations and general purpose networks to meet those needs.

#### **D. SUMMARY OF CHAPTERS**

Chapter II examines the current landscape within the USMC, USN, and DOD with regard to development of C4I Workstations and general purpose networks. Chapter III documents an analysis of SAAWC data types and data processing requirements and provides an illustration of how those requirements might be satisfied by an infrastructure of common C4I services. Chapter IV describes the design of the SAAWC prototype using CAPS to decompose the system into a network of data streams and operators. Chapter V provides conclusions, recommendations, and identifies areas in which further research is merited.

## **II. SURVEY OF C4I ARCHITECTURE**

### **A. CHAPTER OVERVIEW**

This chapter discusses the various initiatives and design decisions published by the three C4I program offices influencing the development of the CAC2S. These design decisions represent guidelines and criteria for C4I segment developers, as well as standards for the provision of testing and assigning ratings which describe the levels of compliance to the prescribed architecture that developed segments meet. The DII COE provides a high-level Information Systems (IS) architectural plan for the building of C4I, Sensor, Weapons, and Combat Support systems. These systems will provide an operational environment which optimizes the flow of data vertically through the levels of operation, and horizontally across peer services and agencies. Of the three programs, only the DII COE is not an actual system. The Global Command and Control System (GCCS) is a C4I system designed to incorporate core operational, intelligence, and communication planning and execution functionality, and is intended to be the target architectural environment for each of the service-specific C4I system variants. The Joint Maritime Command Information System (JMCIS) is the USN/USMC variant of the GCCS system, incorporating functionality unique to the maritime character of USN/USMC warfare.

### **B. DEFENSE INFORMATION INFRASTRUCTURE COMMON OPERATING ENVIRONMENT (DII COE)**

[JOINT95] proposes a concept, C4I for the Warrior (C4IFTW), which calls for the development of a general purpose architecture in which users at the tactical, operational,



and strategic levels work within a common operating environment accessing shared data pertinent to the prosecution of their particular missions. The C4IFTW vision is articulated as follows: "The warrior needs a fused, real-time, true picture of the battlespace and the ability to order, respond and coordinate vertically and horizontally to the degree necessary to prosecute the mission in that battlespace."

The DII Master Plan is a blueprint for implementing the technical infrastructure, shared services, and functional applications facilitating interoperability and collaboration among the DOD Services, Agencies, Office of the Secretary of Defense (OSD), and Joint Staff in order to accomplish the C4IFTW concept. The DII itself can be described as a seamless, worldwide, secure, standards-based web of computing hardware, software, and communication links designed to meet the information processing needs of DOD users in peace and in time of conflict. The primary purpose of the DII Master Plan is to identify and document current and future elements of the DII which enable interoperability and collaboration, define the roles and responsibilities of those falling under the cognizance of the DII, and to identify and document the relationships among current DII initiatives.

That portion of the DII Master Plan responsible for defining the set of integrated support services and software development environment for the DII shared technologies is the DII Common Operating Environment (COE). The DII COE contains the detailed technical specifications which support the DII architecture in accordance with the Technical Architecture Framework for Information Management (TAFIM) and DOD Joint Technical Architecture (JTA). The DII COE is an evolving computer systems

architecture, a set of standards designed to take advantage of commercial sector technology and methodology, and a vision to guide the development of C4I and non-C4I mission domain computer systems which realize the C4IFTW vision.

The DII COE defines three layers: Kernel, Infrastructure Services (Data Exchange), and Common Support Applications. The Kernel includes the computer operating system and extensions, the common desktop, software install and de-install tools, security extensions, and printer services. The Infrastructure Services layer, a horizontal layer, identifies RDBMS servers/clients, Web servers/clients, network management processes, message profiling, office automation, and PC services. Common Support Applications, also called vertical market services, include Mapping, Charting, Geodesy, and Imagery (MCG&I ), communications input and output, message encoding and decoding, correlation and fusion, and tactical data replication. Mission Applications, or segments in DII COE terminology, are developed to run on top of these three layers in accordance with the DII COE Integration & Run Time Specification, which defines the manner in which an application is to interact with underlying layers and with other, peer, mission applications. Additionally, this document identifies eight levels of DII COE compliance which provide a benchmark for judging the qualification of a mission application in meeting DII COE standards. The D6 directorate, Joint Interoperability and Engineering Organization (JIEO), within the Defense Information Systems Agency (DISA), is the cognizant authority for developing and publishing the DII COE and anticipates major releases of the standard being published every 18 months, with minor

releases being published every 6 months. A release schedule is available, on the World Wide Web, at <http://spider.osfi.disa.mil/dii/coe/COEDevel/COEDevelopment.htm>.

### **C. GLOBAL COMMAND AND CONTROL SYSTEM (GCCS)**

To use a computer programming metaphor, if the DII COE is the specification for a "class", then the GCCS is the instantiation of that class, or the object itself. The GCCS is an actual system, developed to fulfill the C4IFTW vision as it pertains to the functions of Command, Control, Communications, and Intelligence. The GCCS was originally conceived as a replacement for the World Wide Military Command and Control System (WWMCCS), the mainframe-based system which has served the command and control needs of high-level US military commands for over two decades. It is now also targeted as the system which will satisfy the vision of the C4IFTW concept.

In February, 1995, a GCCS Design Working Group was convened [BUTLER96] to specify, define, and publish an architectural style and a set of specific architectural components designed to satisfy both documented GCCS COE requirements and the GCCS baseline environment. A number of command and control scenarios were developed and analyzed in order to determine the behavior and interrelationships of the architectural components the group had identified. The group came to the conclusion, documented in [BUTLER96] and [MOXLEY96-1], that a traditional two-tier architecture was unlikely to provide the robustness and flexibility required in a computing environment envisioned to satisfy both real-time needs and non-real-time needs, processing tactical and non-tactical data, and incorporating both high-speed LAN technology and lower-speed

WAN technology in a single global C4I network. They proposed as an alternative a three-tier architecture incorporating a "subscription broker" middle tier to serve as a mediator between consumer-oriented processes (traditional clients) and producer-oriented processes (traditional servers). This design decision is significant because it has repercussions not only for GCCS, but for every GCCS variant, such as the USN/USMC JMCIS, and every GCCS variant segment, such as a JMCIS application to monitor and control the prosecution of air defense operations. The CAC2S must be specified and designed with this in mind.

A three-tier architecture supports several common software engineering principles. It supports modularity and encapsulation, or information hiding, by allowing for the development of clients and servers with no need for knowledge of the implementation details another module might use. This significantly enhances the independence with which clients and services can be developed. It minimizes the amount of required system-wide knowledge, which now consists of only data types and services, as described in [BUTLER96]. It also supports the coexistence of persistent and non-persistent data, which is critical to the concept of combining real-time and non-real-time data requirements, by providing a brokered structure which prioritizes the delivery of information.

In a GCCS three-tier-architecture, client applications are mission-specific data consumers which might support the decision-making processes of analysts and operators. The subscription broker might be implemented using the Distributed Object Management

(DOM) architecture and one of two, or both, DOM technologies: the Distributed Computing Environment (DCE) and the Common Object Request Broker Architecture (CORBA). [BUTLER96] defines two groups of services: infrastructure services, and the services provided on behalf of common support applications. Among the former are communications services such as the TCP/IP applications Simple Mail Transport Protocol (SMTP), File Transfer Protocol (FTP), and Telnet, security services, name services, time services, object interchange services, data management and file management services, and presentation services such as print and device services. Common support application services include alert services, correlation services, message services, and MCG&I services.

Perhaps the most distinguishing factor of a server is the type of data, or data category, for which it is responsible. Rather than being categorized by the source, data is categorized by what it describes. In grouping data by what it describes, more efficient algorithms can be developed for parsing, sorting, and archiving that data, and more stable Application Programming Interfaces (APIs) can be written to request and process that data.

#### **D. JOINT MARITIME COMMAND INFORMATION SYSTEM (JMCIS) '98**

JMCIS is the maritime variant of GCCS, and JMCIS'98 is the latest version of the system. JMCIS'98 marks a radical departure from the legacy systems from which it descended. A principle tenet of the JMCIS'98 project is to significantly leverage COTS systems and the Windows/PC architecture.

As JMCIS is the target maritime C4I Workstation, it is incumbent upon the Marine Corps to be active agents in the process of identifying CAC2S requirements as they pertain to the JMCIS architecture and to ensure that CAC2S components are fully capable of seamlessly integrating within that architecture. JMCIS component programs, such as CAC2S, are responsible for documenting, validating, and presenting Operational Requirements Documents (ORDs) to the Copernicus Requirements Working Group (CRWG), the semi-annual forum for soliciting and prioritizing JMCIS requirements from the maritime services. A CRWG database with a Web-based interface provides the mechanism for JMCIS component program managers to track the progress of their requirements from identification to deployment. The database is accessible, on the World Wide Web, at <http://copernicus.bahsd.com>.

A keystone document, [JMCIS97], elaborates on the planned migration of JMCIS from a network of heterogeneous UNIX systems to a Web and PC-based operating environment, leveraging the private sector investments in Information Technology (IT) and simplifying maintenance and training on IT systems. Specifically, [JMCIS97] identifies six key tenets of JMCIS'98: migration to the DII COE, migration to PC Workstations and Servers, industry capitalization, combination of tactical and non-tactical networks, employment of "leading-edge" logistics, and streamlining of the acquisition process. JMCIS'98 will exercise an accelerated test/evaluate/certify/deploy cycle using the USS Coronado (AGF11) as a "Joint Battle Lab" to ensure suitability of the JMCIS'98 architecture and its components. Five architectural phases have been defined to enable the

migration of JMCIS to the target environment while concurrently meeting the operational requirements of the Fleet. The phases are identified under the JMCIS Unified Migration Plan (JUMP).

Finally, the Joint Maritime Communications System (JMCOMS) is the communications infrastructure upon which JMCIS'98 will be implemented. This infrastructure will be composed of a combination of high-speed LANs, lower-speed WANs, dedicated wireless SATCOM and LOS transmission, and on-demand (dial-up) service.

#### **E. SUMMARY**

The paradigm for performing requirements analysis and system specification for a complex, mission-critical, operational domain has clearly shifted. While the need to accurately identify domain-specific data elements and data processing functionality remains as critical as ever, now this analysis and specification must take place within the context of the architectural guidelines developed by the DII COE, GCCS, and JMCIS programs. A successful CAC2S operating environment will maximize the use of underlying infrastructure and common support application services, be designed to scale equally well across high-speed LAN and lower-speed WAN networks, and will create and deploy data type objects which facilitate their processing and transportation in a distributed TCP/IP network.

### **III. SECTOR ANTI AIR WARFARE CENTER (SAAWC) FUNCTIONALITY**

#### **A. CHAPTER OVERVIEW**

One of the keys to successfully migrating the MACCS from the suite of legacy equipment and processes it currently possesses to a DII COE compliant distributed computing environment is to identify the potential objects within the system. Those objects represent the data types manipulated by the system as well as the functional processes which provide the services to manipulate those data types. Objects are collections of data, or attributes, and the operations, or methods, which act on those collections of data. The design of a DII COE compliant MACCS cannot begin without a thorough and accurate specification of every object expected to occur in the MACCS domain. Every data type, from a track object to an imagery object, must be specified as a discrete collection of attributes: defined fields, values, and constraints, and a discrete collection of methods. Those methods are defined operations which permit the retrieval, initialization, and modification of those attributes. Every functional service, from track services to security services, must also be specified as an object. A track server, for example, would be specified as an object with index, communication, and storage components implementing the functionality of an abstract machine. That abstract machine would be capable of collecting, organizing, and distributing information on tracks, themselves abstract representations of real-world planned or active events. The importance of deliberate and exhaustive specification of the data types and processes which exist and act in the MACCS domain, and specifically, the treatment of these entities



as objects which resemble and behave in predictable, real-world manner, is to take advantage of a future distributed computing architecture which will facilitate the movement and interaction of objects across a transparent, yet heterogeneous, network of dissimilar computing platforms.

Standards such as Distributed Computing Environment (DCE) and Common Object Request Broker Architecture (CORBA), protocols such as Hyper Text Transfer Protocol (HTTP) and Internet Inter-ORB Protocol (IIOP), and runtime environment paradigms such as the Java Virtual Machine (JVM) are currently being implemented inside and outside of the DOD and represent the distributed computing architecture of tomorrow. The following discussion of SAAWC data types and functional processes represents a beginning for the specification of the objects required to implement the desired SAAWC functionality.

## **B. SAAWC PROCESSES**

[SAAWC95] identifies seven "displays", or user interfaces, required to provide the Sector Anti-air Warfare Coordinator (SAWC) and the SAAWC staff with the information they need to conduct Air Defense Battle Management (ADBM). The SAWC is the chief architect of the ADBM plan and coordinates its implementation. The SAAWC is the collection of systems, personnel, and procedures used to execute the ADBM. These seven user interfaces can be used as metaphors for higher-level, or composite, "processes" within the SAAWC that can be further decomposed into client processes, broker processes, and server processes. Furthermore, this decomposition will identify processes,

such as a track serving process, which several upper level processes commonly require. The identification of user interfaces as "processes" has the additional advantage of providing for efficient scaling with minimal redesign effort. In a small-scale implementation of the SAAWC, for example, a single workstation or processor may interleave all of the SAAWC processes, permitting the operation of all the SAAWC user interfaces on a single machine. Alternatively, in a large-scale implementation of the SAAWC, a single workstation or processor might be dedicated to each process, providing not only one machine for each of the SAAWC user interfaces but also one machine each dedicated to such processes as a data management server, communications server, track server, and so on. Either small-scale or large-scale implementations could include spare workstations or processors loaded with client and server processes to provide the system with a robust, fault-tolerant design. A complete representation of all SAAWC functional processes is presented as figure 1.

SAAWC functionality is described in [SAAWC95] as requiring the following user interfaces: Air Defense Mission Display (ADMD), Offensive Air Support (OAS) Mission Display (OMD), Air Defense Situation Display (ADSD), Communication Status Display (CSD), Equipment Status Display (ESD), Intelligence Display (ID), Air Situation Display (ASD). Together these user interfaces enable the SAAWC and his staff to maintain a timely, accurate BA, plan future air defense missions and postures, and identify air defense requirements which aren't being met. In addition to these missions, the SAAWC must also

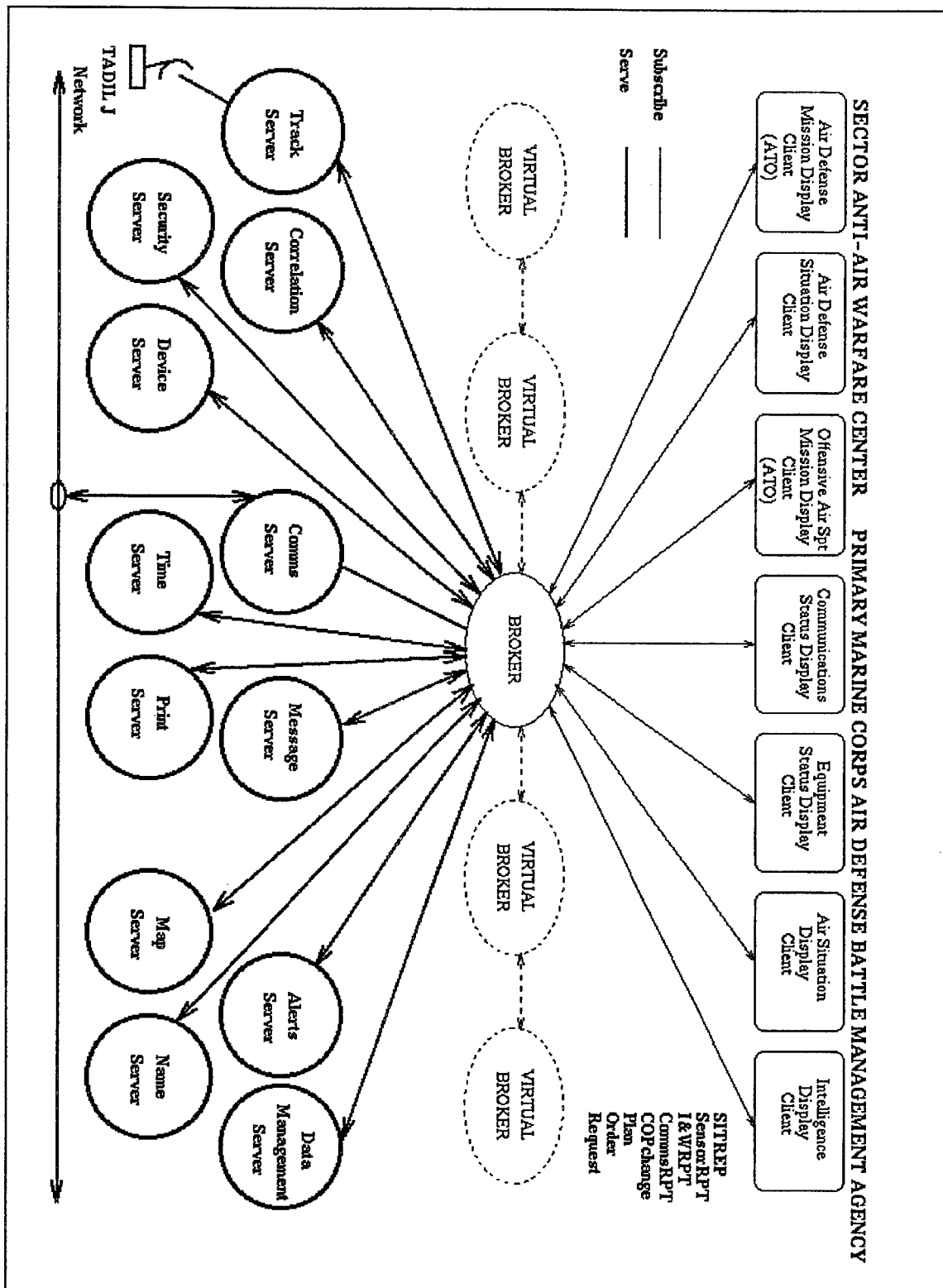


Figure 1. SAAWC Functional Processes

be capable of becoming the alternate Tactical Air Command Center (TACC), should that facility become a casualty.

The first of the SAAWC user interfaces, the ADMD, will contain information from the Air Tasking Order (ATO) relevant to the prosecution of air defense. Within those subsections of the ATO deemed pertinent, the display must include information regarding mission numbers, call signs, mission type, ordnance/fuel, time on and off station, IFF codes, mission status, terminal control agency and frequency, package designator, routing information, and tanker availability.

The OMD will contain information from that subsection of the ATO pertaining to Close Air Support (CAS), Deep Air Support (DAS), Air Reconnaissance, Electronic Warfare (EW), and Offensive Antiair Warfare (OAAW) missions. The required information within those subsections of the ATO is identical to that of the ADMD, with the exception that more detail regarding air-to-air and air-to-ground ordnance must be provided.

The ADSD will present a real-time depiction of the current air battlefield picture. It must accomplish this through the presentation of "tracks", which represent air, ground, and seaborne entities which may have friendly, foe, unidentified, fixed, and mobile characteristics. Additionally, this display will include air defense warning conditions and weapons control status, Combat Air Patrol (CAP)/Fighter Engagement Zone (FEZ) manning, Missile Engagement Zone (MEZ) status as part of the Ground based Air

Defense (GBAD) status, States of Alert (SOA), missile inventories for ground-to-air missiles, and tanker assets, including tanker fuel availability.

The Air Situation Display will present a superset of the information presented by the Air Defense Situation Display with the purpose of enabling the Sector Antiair Warfare Coordinator and his staff to make timely decisions regarding future employment and deployment of air defense assets. The Communication Status Display will present to the SAWC and his staff a graphic depiction of communications personnel, equipment, and circuit status. Pertinent information will include circuit names, designators, equipment types, cryptographic means, frequencies, and status. The Equipment Status Display will present a battlefield picture of the operational status of equipment associated with designated higher, adjacent, and supporting units. Pertinent applications might include surveying the status of organic radar units, airfield control units, and weather forecasting units. The Intelligence Display will present a battlefield picture consisting primarily of static information. Friendly Order of Battle (FOB) and Enemy Order of Battle (EOB), designated facilities, friendly scheme of maneuver, and predicted enemy schemes of maneuver will be available to the Intelligence Analyst interacting with the ID.

### **C. SAAWC DATA TYPES**

There are a number of fundamental data types which enable the SAWC and his staff to plan, decide, and execute their assigned tasks. Foremost among these is the concept of a "track" data type. The conventional representation of a track is as a set of ascii text characters describing a real-world object, either fixed or mobile, ground-based,

air-based, or sea-based, and friendly, foe, or unidentified. It is the principal data type used to convey meaningful information to the MACCS operators and analysts regarding the prosecution of an air battle. At the most basic level, and as it exists in a Tactical Data Link (TADIL) system like TADIL J, a track is a bit-oriented subset of a data stream which is machine readable, and is manipulated by a special purpose TADIL processor to produce something which is man-readable and conveys meaningful information to an operator.

A TADIL J message is composed of, normally, 1, 2, or 3 Link-16 words, each word containing 70 bits of data. TADIL J, or Link 16, is the Joint Services and NATO forces standard for the exchange of real-time tactical data among units of the force. A J-series message has the potential for carrying information representing a real-world object's identification, status, activity, location, speed, bearing, and electronic operating parameters, along with information pertaining to the track itself, such as reporting source, track number, and track quality. The TADIL J implementation of the track data type is a significant enhancement to the process of forming a meaningful air battlefield picture.

Another fundamental data type is the character-oriented, man and machine readable, USMTF record message. The USMTF message set is a collection of mission and situation specific formatted message templates used to document and disseminate meaningful information on every subject from plans and operational orders to chemical attack reports and intelligence summaries. Of particular interest to the SAWC and his staff are the ATO and Situation Reports (SITREP). The ATO is the principal means for disseminating information pertaining to the conduct of aircraft missions (sorties) during a

given period of time. It is composed of subsets of information which describe the times, activities, units, platforms, payload, and communications details for specific air missions.

The ATO itself is a poor choice for a data type. Most units, and the SAAWC is no exception, are concerned with only that portion of the ATO which pertains to the prosecution of their assigned tasks. The ATO may still have utility as a tool for an ACE commander and his staff to review the projected employment of air assets during a given period of time. However, given the advances in messaging and database technology, the ATO is more appropriately considered as a user-defined collection of air missions which have been developed, documented, and disseminated for the purpose of setting up the air-related battlefield picture for a user-defined period of time. A single "air sortie" data type is a much more precise, efficient, and meaningful way in which to represent a real-world concept which, when executed, becomes the real-world object that is an active air sortie. In addition to providing a clear, simple transition to a track data type, an air sortie data type is much simpler to implement in a messaging and database driven environment.

The USMTF formatted SITREP message is a clear, succinct vehicle for conveying meaningful information pertaining to a unit's current status. As such, it is a good data type for representing the unit, equipment, and weapons system conditions and status that are required by the SAWC and his staff. The well-defined format and widespread adoption of the SITREP make it a logical choice for a data type capable of representing real-world

concepts: current operating status, current weapons alert conditions, current unit preparations. A SITREP data type is well-suited for both periodic and ad hoc messaging, and for database archival and retrieval.

A number of additional USMTF message formats are defined for the purpose of conveying special purpose information of central and peripheral interest to the SAWC and his staff. Requests for supplies, changes to unit employment, and task-related liaison with designated units are a few of the many needs fulfilled by USMTF messages. These real-world concepts should be examined in another forum as potential data types whose graphical representation could be location or functional area-based and whose representation as a data type serves the purpose of logging, alerting, and managing units, plans, and events as they occur during the prosecution of a battle.

#### **D. PRODUCERS**

The producers in a three-tier, DII COE compliant implementation of the SAAWC are those entities capable of generating computational representations of the real-world objects, concepts, and states which portray the battlefield picture at given intervals of time. They are those processes which, either through user input or electro-mechanical detection and identification, construct ADTs which can be transmitted by computer networks and manipulated by computer clients to form a meaningful depiction of a state of battle. Referring to [BUTLER96], a collection of producers would potentially include those common service providers representing the bottom tier of the client/broker/server architecture.



These common service providers include a track server, which would produce track objects representing real-world battlefield entities. Emphasis for the operation of a track server would be on near-real-time reporting of entity characteristics at the expense of possible duplicate, non-correlated, and incompletely identified tracks. The majority of tracks would be perishable in nature, and much of the value provided would be in their timely presentation to the weapons control, sensor control, or display client consumer. A secondary consideration for the consumption of tracks would be for their use in reconstructing events at a later date for the purposes of investigation or training. A track server might be implemented as a dynamic, real-time Relational Database Management System (RDBMS), in which the timing constraints facilitated by priority-based scheduling must be considered in addition to the traditional goal of guaranteeing database consistency.

A Data Management Server, described in [BUTLER96], would consist of three server types: an object-base server, a data management server, and a file server. An object server would produce "intelligent" objects, binary blobs of code which could facilitate communication between client objects and server objects. This data server would provide all the intelligence, i.e., knowledge of the attributes of objects and of their relations to other objects, that a client would need to establish a run-time liaison with a server object. The data management server would produce the interfaces required for communication between clients and various proprietary implementations of Relational Database Management Systems (RDBMS). The file server would produce a single name

space, hierarchical view of the file system in which all files are presented to the client as if they were located in a single tree structure, on a single system. Resolution of logical file names to their actual names and locations is accomplished by the Name Server, described below. The File Server, in conjunction with the Name Server, hides the actual physical location of files from the client, permitting the client to make requests for files in a manner most appropriate to its implementation. Additionally, the File Server enforces rules for the concurrent reading/reading and reading/writing of files by distributed clients as well as the required notification/flushing of invalid copies of files held by clients.

The Data Management Server is of particular interest to the SAAWC clients, as it would produce track objects representing evaluated and validated real-world objects which add intelligence to the battlefield picture. Known airfields, Surface to Air Missile (SAM) sites, and Early Warning (EW) radar sites are examples of static entities which might be served in a non-real-time manner to a weapons control, sensor control, or display client consumer. The implementation of a Data Management Server which provided static data in a track data type format would facilitate the transmission and reception of this data in a TADIL broadcast, as well as provide for the consumption of the data by clients generating request over traditional Local Area and Wide Area Networks. Finally, the implementation of a Correlation Server would be simplified by the specification of both perishable and non-perishable formats for a track data type by eliminating the requirement for translation between unlike data representations such as tracks and database records.

A Correlation Server would be a source for data fusion within the system,

providing "value-added" intelligence to the tracks it was subscribing to as a track consumer, producing a track with a higher level of assurance to subscribing consumers. Emphasizing data consistency and employing a set of business rules which enable the correlation of perishable tracks with one another, and perishable tracks with database records, the Correlation Server might generate tracks carrying a validity qualification which permitted their overwriting of less valid tracks stored locally at the subscribing consumer. The quality of a Correlation Server's produced tracks would be valuable both to a non-real-time track consumer and to a real-time track consumer, tasked both with providing what is known in the Intelligence community as data of an Indications and Warning nature as well as with providing data of an Intelligence (evaluated information) nature.

A Security Server would be responsible for providing the security services required to enable distributed processing and communication services which preserved the authenticity, secrecy, and integrity of the transmitted data. Specifically, the Security Server might produce certificates upon request by a client which enables the process of authenticating communications between the client and a specified server. The Security Server might also produce cryptographic keys which enable the client and server to communicate in a manner which disguises the nature of their communications. Finally, a Security Server might produce digital signatures for communicating processes which provides a mechanism for detecting the alteration of data enroute from a sending process to a receiving process.

The Security Server plays a critical role in a distributed computing environment in which mobile code transits not only LANs but also, increasingly, WANs. Centralizing the role of security in a server enables turnkey solutions, such as the Kerberos Server, to be implemented, while at the same time allowing intelligence to be built into clients permitting dynamic determination of the needs and levels of secure communication. Appendix C provides elaborating information on the Kerberos Server.

A Time Server simplifies the process of synchronization between networked processes. Each server in the three-tier architecture might subscribe to the Time Server, consuming the produced timestamps which facilitate synchronization among cooperating processes. Timestamps are a critical means for permitting correctness in computation and for auditing computing histories.

An Alert Server would produce simple messages, alerts, in response to an alert filter profile created by a subscribing client process. These messages could be in audio, visual, text-based, or graphics-based format, and they might reference the track, record, or message data type identified in the alert filter profile. An intelligent Alert Server implementation would subscribe to and monitor both real-time and non-real-time streams of data types transiting the network, and generate alerts which contained references to the identification and location within the system of the subject data type. Centralizing alert services permits the reduction of redundancy within the system. If, for example, several client consumers have indicated interest in the release of a pending operation order message, only one process need monitor the network for that message, and only one copy

of that message need be saved and referenced by the alerted clients. An Alert Server should be capable of producing alerts based upon profiled real-world objects, real-world concepts, and real-world events, as well as computer-related conceptions such as alerts to other servers, for example, to initiate back-ups to their secondary or off-site storage.

A Map Server would produce the appropriate vector or raster depiction of the requested display background. This server could function as a single-point repository for navigational charts, tactical maps, and digital images, as well as vector-based geographical displays. Additionally, non-traditional maps, such as the inside of a warehouse, or a computer-driven electronic "message board", could be produced, rendered as vector diagrams, and used by subscribing clients to provide spatial and chronological context for supply "tracks" or record message "tracks" which are graphically displayed on the client machine. The primary responsibility of the Map Server is to produce background displays which provide the most appropriate context in which the user can draw conclusions from the overlaid "track" information. Whereas initial implementations of a Map Server might force the client to subscribe to specific display types and scales, an intelligent implementation might make display type and scale decisions based upon the "clutter" of tracks, display resolution, display size of the consuming client, and user selection.

A Name Server would provide the critical function of mapping logical names to physical locations throughout the network. The Name Server would produce references to the real-world objects, concepts, and events in the naming context which was most appropriate to the subscribing consumer, resolving the requests to determine the correct

identification and location of the named entity. The resolved names produced must permit quick, efficient, and accurate communication across the network between the subscribing client and the server storing the resolved entity. A single source, name-resolving process simplifies the operations of adding and removing clients, brokers, servers, devices, and network protocols to and from the network.

A Message Server would be a client subscriber to the Communications Server, parsing, archiving, and forwarding to subscribing clients references to requested messages. The intelligence built into a Message Server would consist of the functionality to recognize message formats and to properly distribute messages to the primary or secondary storage of its subscribers. For example, tracks from a non-TADIL source would be forwarded to the Track and Correlation Server for processing and archival, while SITREPS would be forwarded to a local message library and to addressed subscribers. A Message Server is a producer in the sense that it takes character-based man-readable and machine-readable data from the Communications Server and produces a formatted message recognizable to subscribing clients. A Message Server might also be a repository for message format templates which facilitate the correct drafting of messages by clients, as well as a repository for message addressee templates which simplifys the process of addressing messages.

Finally, a Communications Server would manage the interfaces required by clients to access and employ application level processes specific to the underlying network protocols. For example, the Communications Server would provide TCP/IP-based

SMTP, SNMP, FTP, Telnet, and HTTP services to subscribing clients, enabling them to be designed in such a manner as to focus on data type and service type needs rather than on communication type specifications. A Communications Server would work hand in hand with a Network Server, translating messages into data streams packaged for communication over particular datalink, network, and transport layer configurations, in addition to unpacking received data streams for subscribing clients.

## **E. CONSUMERS**

In the truest sense of the term client, most producers are themselves also clients of certain data types and processes. For example, every producer would subscribe to the broker for timestamps provided by the Time Server. Certainly, our broker in the three-tier architecture is also a client of the data provided by the various servers. However, for the purposes of this paper, the clients of interest are those identified in a review of required functionality for the SAAWC: Air Defense Mission Display, Air Defense Situation Display, Offensive Air Support Mission Display, Air Situation Display, Intelligence Display, Communications Status Display, and Equipment Status Display.

These clients are themselves composite entities containing atomic clients: they are the principal interface between the human operator and the processes which receive, store, manipulate, and present data in a meaningful manner to him. It is in this context that clients are described. They are presented as the composite operator which organizes and coordinates the processes responsible for consuming requested data elements as well as commands from the human operator.

The ADMD client and the OMD client both exist for the purpose of presenting graphical representations of those portions of the ATO pertinent to the respective Displays. This is the principal means by which the human operator is able to develop a comprehensive FOB for a given period of time, for the purpose of prosecuting air defense and offensive air support tasks. The two display clients consume the digitized charts, maps and images, received from the Map Server, and present them to the operator in a manner which conveys the spatial and chronologic ordering of air sorties described in the ATO. The two display clients also consume queried air sortie data types, presenting them as tracks representing the concept of planned but not yet executed missions.

By focusing on the background display needs of the human operator, and using the inherent geographic, functional, and chronologic attributes of the planned air sorties, powerful relations can be drawn and displayed to the operator which relate the planned air battlespace in a manner which provides intelligence to the battlefield. For example, if an operator desires to see a given area of the air battlefield, then his request should be interpreted not only as an invocation to display the geographic area, but also as a query into the sortie database to display those air sortie tracks which are related to the requested area. In another example, if an operator desires to see chronologic coverage of a needed asset, say air refueling, then a request to display a timeline should also invoke a query to display those air sortie tracks functionally related to the request, and in a manner which conveys their relation to the displayed timeline. By considering, designing, and creating these different data elements, charts, timelines, and planned sorties, as



computer-generated, object-oriented manifestations of real-world concepts, we can develop computer-derived presentations of real-world events which encapsulate the meaning of activities such as personnel and equipment moving through the air battlefield.

Furthermore, by describing data elements, such as air sorties, as tracks representing unexecuted missions, it provides for a simple, yet powerful means by which real-world concepts can be transformed into the real-world events which are of interest to the ASD, ADSD, and ID clients. These clients are the principal means by which the SAWC and the SAAWC operators monitor the real-time events of the air battlefield. These clients also should incorporate the mechanisms for consuming and presenting to the operator background displays which convey the geographical and chronologic boundaries of the air battlespace, as well as the activity within those boundaries, on behalf of the respective air and air defense controllers. The consumed tracks, in this case, are those tracks representing actual missions, sea-based and ground-based as well as air-based, which have a direct bearing on the controlled battlespace. All tracks would consist of geographic, functional, and chronologic attributes which mark them for retrieval from a locally stored, dynamically updated database, to be displayed upon the triggering background display.

The radical departure from the traditional means of depicting the battlespace as a two-dimensional field of sensor-derived contacts, as is the case with current TADIL processor and display subsystems, would be a shift in recognition that the source of data is much less important to the operators and analysts than is the type of that data. In a battle

environment where tactical events begin as concepts, become executing events, influence other executing events, then evolve into historical occurrences, the common thread that is the grouping of personnel, equipment, and tactics should be encapsulated into a common, consistent data type. That data type would be composed of attributes which illustrate its state, facilitate its manipulation by computing processes, and permit its representation to a human operator in ways which allow him to draw intelligent and meaningful conclusions about the prosecution of battle.

The CSD and the ESD clients principally consume information regarding the operation of the components responsible for the SAAWC communication, computing, and presentation infrastructure. A traditional interpretation of this functionality consists primarily of equipment and network status messages which indicate the current operating condition of the system devices and communication links. A broader interpretation includes status messages indicating traffic flow, logging of system events, and information pertaining to the configuration of the equipment such as the procedures traditionally found in the Communications Annex, Annex K, of an operational plan. The CSD and ESD clients might consume geographical displays from a Map Server for presentation to the user as a background, representing an abstraction of the real-world locations and activities of his communications and computing devices. Status messages might be objects, which are generated and modified by Communications and Device Servers, with methods permitting the display of the objects as tracks, or their forwarding to other clients for action. What is of significant interest to these clients is that these configuration and status

messages be modeled as objects which represent the abstract notion of the state of computing machines and computing networks, and are defined in a manner both to make their manipulation and presentation by clients responsible for these activities simpler, and to facilitate this presentation so that it contributes to the notion of a COP and provides intelligence to an otherwise dissimilar and unrelated collection of events.

## **F. SUMMARY**

The preceding discussion of data types, processes, producers and consumers, which are all part of the SAAWC operational domain, is intended to illuminate the process of developing computing domain implementations of operating domain entities. This is the critical first step in the process of designing an Automated Information System (AIS) solution to an identified operational need: in this case the need to build a general purpose, "Battlefield Awareness Machine", capable of bringing coherence to the air battlespace for which SAAWC operators are responsible.

An important observation, regarding the processes and services described above, is that many are generic services typical of those found in a distributed computing environment. They are also common to the command, control, communications, intelligence, administration, logistics, and other assorted activities taking place throughout a given organization at the tactical, operational, and strategic levels. Furthermore, many, if not all, of these services are currently specified and implemented both in Commercial Off The Shelf (COTS) and Government Off The Shelf (GOTS) solutions which are part of current, or planned, versions of the GCCS and Global Combat Support System (GCSS).

## **IV. PROTOTYPE DESIGN**

### **A. CHAPTER OVERVIEW**

This chapter describes the methodology used to develop the SAAWC prototype with the CAPS tool, as well as the steps taken to build that prototype. Also described are the various tools used in addition to CAPS to model process interaction and message flow in order to produce a prototype which most accurately captures the behavior exhibited in the SAAWC. The chapter serves to document the analytical process responsible for the composite and atomic functionality designed into the SAAWC prototype.

### **B. COMPUTER AIDED PROTOTYPING SYSTEM (CAPS)**

The Computer Aided Prototyping System is a software engineering solution to the need to rapidly develop executable prototypes from user specifications to contribute to the accurate, correct, and satisfactory development of Automated Information Systems. CAPS was developed at the Naval Postgraduate School as a tool for modeling real-time embedded software systems which exhibit the control and timing constraints expected in the modeled system itself. CAPS is an operating environment which consists of a set of tools which permit the prototype designer to graphically depict functional operators and data streams at composite and atomic levels. CAPS uses a fifth-generation prototyping language, PSDL, which provides the designer with the mechanisms needed to implement the timing and control constraints, messaging, and data typing in the prototype. Through an integrated scheduler and translator, CAPS creates the Ada language specifications for each atomic operator, data stream, and user-defined data type. In addition, CAPS

provides the implementation for a main procedure which dictates the timed behavior of the prototype and how exceptions developed during prototype runtime are handled. CAPS includes the functionality to invoke an Ada compiler for the production of the prototype executable code.

### **C. PRELIMINARY DESIGNS**

In preparation for using the CAPS graphical editor to determine composite and atomic operators and associated data streams, preliminary designs were constructed using the X-Windows drawing tool known as xfig. This approach proved beneficial for two reasons: operator and data stream placement could more easily be initiated and changed, in attempts to reduce screen clutter and improve viewing clarity, because the screen redrawing was more efficient; and additions and deletions to the existing operators and data streams were not associated with the creation and modification of PSDL code, which lessened the likelihood of garbage declarations occurring in the PSDL code during the CAPS graphical editing phase. Drawings with the xfig tool were created to represent the high-level SAAWC as well as single-level decompositions of all the SAAWC composite operators. A sample drawing, of the decomposed Broker operator, is presented in figure 2.

A second tool, Microsoft Excel spreadsheet, was used following the stabilization of the xfig drawings to represent event sequences corresponding to desired prototype behavior for typical scenarios. A spreadsheet was created with the horizontal axis representing SAAWC composite operators and the vertical axis marked by consecutive

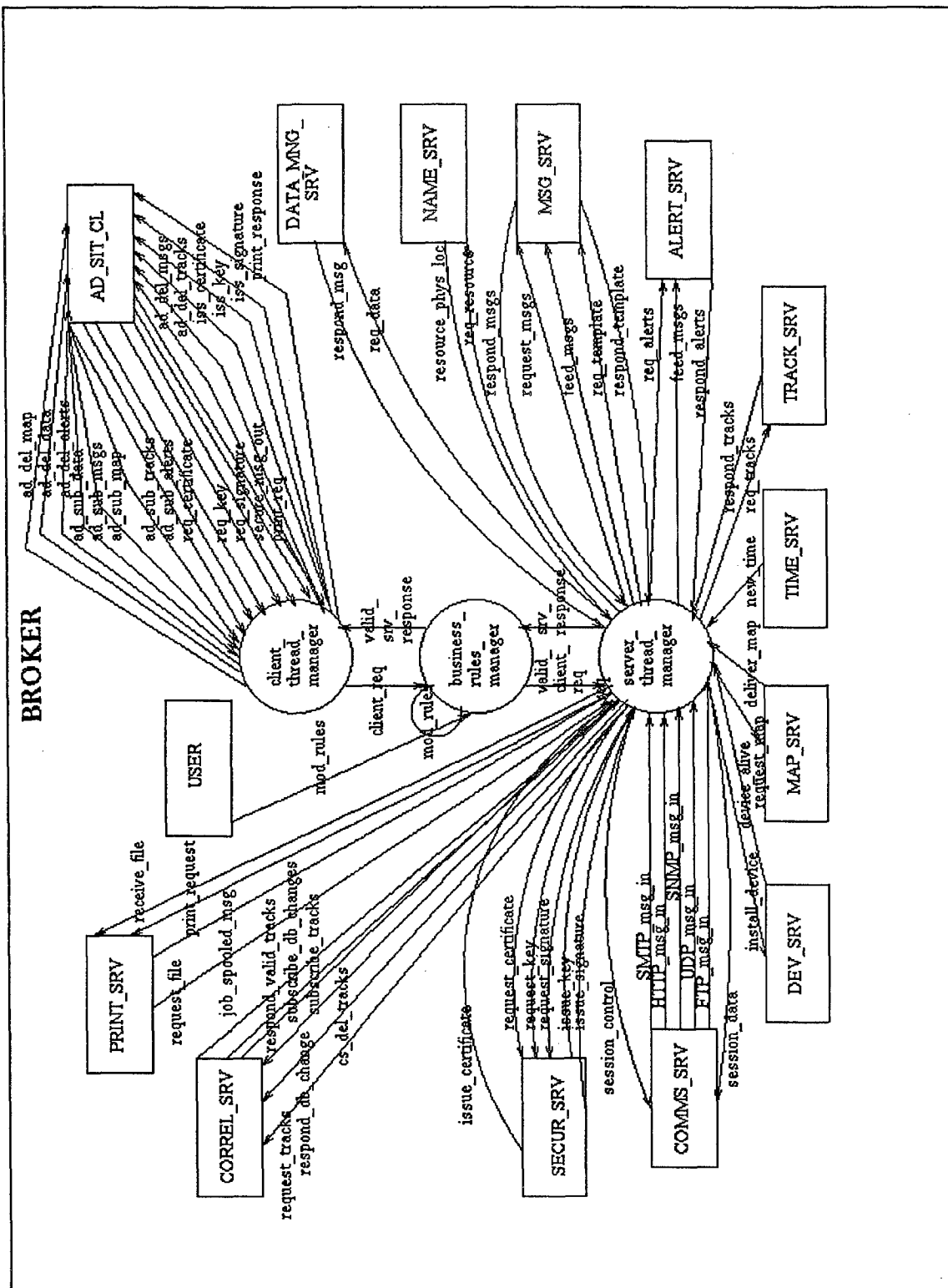


Figure 2. Broker Operator Drawn with xfig

labels for points in time during prototype execution, appearing in chronological order. Spreadsheet cells were populated with a text value representing two concepts: the first is the data stream label associated with the originating SAAWC composite or atomic operator, and the second is a label which uniquely identifies the event which triggered a series of related messages. For example, in figure 3, row 3, column 3, the cell value "ad\_sub\_tracks=tracks\_I\_want" represents a message sent from an atomic operator within the composite operator Air Defense System Display indicating a request to subscribe and receive notification from the system of the presence of a track, or set of tracks, with the particular request being associated with the tag "tracks\_I\_want." The spreadsheet was edited to depict at least one series of messages originating, terminating, or passing through every SAAWC composite operator. The complete spreadsheet is included as Appendix B.

This presentation of associated data flow triggered by system events facilitated the determination of accuracy, correctness, and thoroughness of the initial SAAWC diagrams. In one example where the spreadsheet highlighted an initial system design flaw, during the process of tracing message flow which resulted from a request to display track information, it was determined that such a request logically should also trigger subscriptions and requests to the Correlation Server and to the Data Management Server as well as to the more obvious Track Server.

| TIME | MASTER                               | AIR DEF SYS DISPLAY         | BROKER                           | CORRELATION                        | DATA MANAGEMENT             | TIME                  | TRACK                        |
|------|--------------------------------------|-----------------------------|----------------------------------|------------------------------------|-----------------------------|-----------------------|------------------------------|
| 1    | new_line=970519000001                |                             |                                  |                                    |                             | new_line=970519000001 |                              |
| 2    | filter_tracks=tracks_i_want          | filter_tracks=tracks_i_want |                                  |                                    |                             |                       |                              |
| 3    | ad_sub_tracks=tracks_i_want          | ad_sub_tracks=tracks_i_want |                                  |                                    |                             |                       |                              |
| 4    | client_req=tracks_i_want             |                             | client_req=tracks_i_want         |                                    |                             |                       |                              |
| 5    | valid_client_req=tracks_i_want       |                             | valid_client_req=tracks_i_want   |                                    |                             |                       |                              |
| 6    | req_tracks=tracks_i_want             |                             | req_tracks=tracks_i_want         |                                    |                             |                       |                              |
| 7    | request_tracks=tracks_i_want         |                             | request_tracks=tracks_i_want     |                                    |                             |                       |                              |
| 8    | filter=tracks_i_want                 |                             |                                  |                                    |                             |                       | filter=tracks_i_want         |
| 9    | respond_tracks=tracks_i_want         |                             |                                  |                                    |                             |                       | respond_tracks=tracks_i_want |
| 10   | filter=tracks_i_want                 |                             |                                  | filter=tracks_i_want               |                             |                       |                              |
| 11   | new_line=970519000011                |                             |                                  |                                    |                             | new_line=970519000011 |                              |
| 12   | subscribe_tracks=tracks_i_want       |                             |                                  | subscribe_tracks=tracks_i_want     |                             |                       |                              |
| 13   | subscribe_db_change=tracks_i_want    |                             |                                  | subscribe_db_change=tracks_i_want  |                             |                       |                              |
| 14   | cs_del_tracks=tracks_i_want          |                             | cs_del_tracks=tracks_i_want      |                                    |                             |                       |                              |
| 15   | track_db=tracks_i_want               |                             |                                  | track_db=tracks_i_want             |                             |                       |                              |
| 16   | req_data=tracks_i_want               |                             | req_data=tracks_i_want           |                                    |                             |                       |                              |
| 17   | req_data_type=tracks_i_want          |                             |                                  |                                    | req_data_type=tracks_i_want |                       |                              |
| 18   | req Retr_rec=tracks_i_want           |                             |                                  |                                    | req Retr_rec=tracks_i_want  |                       |                              |
| 19   | req Retr_msg=tracks_i_want           |                             |                                  |                                    | req Retr_msg=tracks_i_want  |                       |                              |
| 20   | respond_msg=tracks_i_want            |                             |                                  |                                    | respond_msg=tracks_i_want   |                       |                              |
| 21   | new_line=970519000021                |                             |                                  |                                    |                             | new_line=970519000021 |                              |
| 22   | respond_db_change=tracks_i_want      |                             | respond_db_change=tracks_i_want  |                                    |                             |                       |                              |
| 23   | record_db=tracks_i_want              |                             |                                  | record_db=tracks_i_want            |                             |                       |                              |
| 24   | valid_tracks=tracks_i_want           |                             |                                  | valid_tracks=tracks_i_want         |                             |                       |                              |
| 25   | respond_valid_tracks=tracks_i_want   |                             |                                  | respond_valid_tracks=tracks_i_want |                             |                       |                              |
| 26   | message_template=add_spot_resp_templ |                             |                                  |                                    |                             |                       |                              |
| 27   | srv_response=tracks_i_want           |                             | srv_response=tracks_i_want       |                                    |                             |                       |                              |
| 28   | valid_srv_response=tracks_i_want     |                             | valid_srv_response=tracks_i_want |                                    |                             |                       |                              |
| 29   | ad_del_tracks=tracks_i_want          |                             | ad_del_tracks=tracks_i_want      |                                    |                             |                       |                              |

Figure 3. Message Flow Table



## **D. CAPS GRAPHICAL EDITING**

### **1. High-level Prototype Decomposition**

The purpose of the CAPS SAAWC prototype, presented as figure 4, is to model the data flow and functional operator interaction which exists within the modeled system, a SAAWC application segment running in the JMCIS environment. In the design of the prototype a decision was made to narrow the scope of simulated SAAWC behavior by including only a decomposition of that functionality specified for the Air Defense System Display (ADSD) operator. This decision was made after analysis of the modeled system indicated overlapping functionality between the seven SAAWC functional operators. The selection of the remaining operators for the high-level SAAWC prototype followed from the identification in previous work of the user interface and of the common infrastructure support and common support application functionality. Three operators were added to simulate external feeds of data or mechanisms for user interaction: a network operator, TADIL\_J operator, and a get\_user\_command operator. An implementation of the network operator would simulate a LAN itself, presenting network-specific packages, in this implementation consisting of a user-defined data type called "bits", to the Communication Server composite operator for further processing. The network operator would similarly receive from the Communication Server operator messages which had been packaged as "bits", and were prepared for transmission onto the simulated network. An implementation of the TADIL\_J operator would simulate a feed from a TADIL J processor, itself capable of presenting "tracks" representing mobile operational entities,

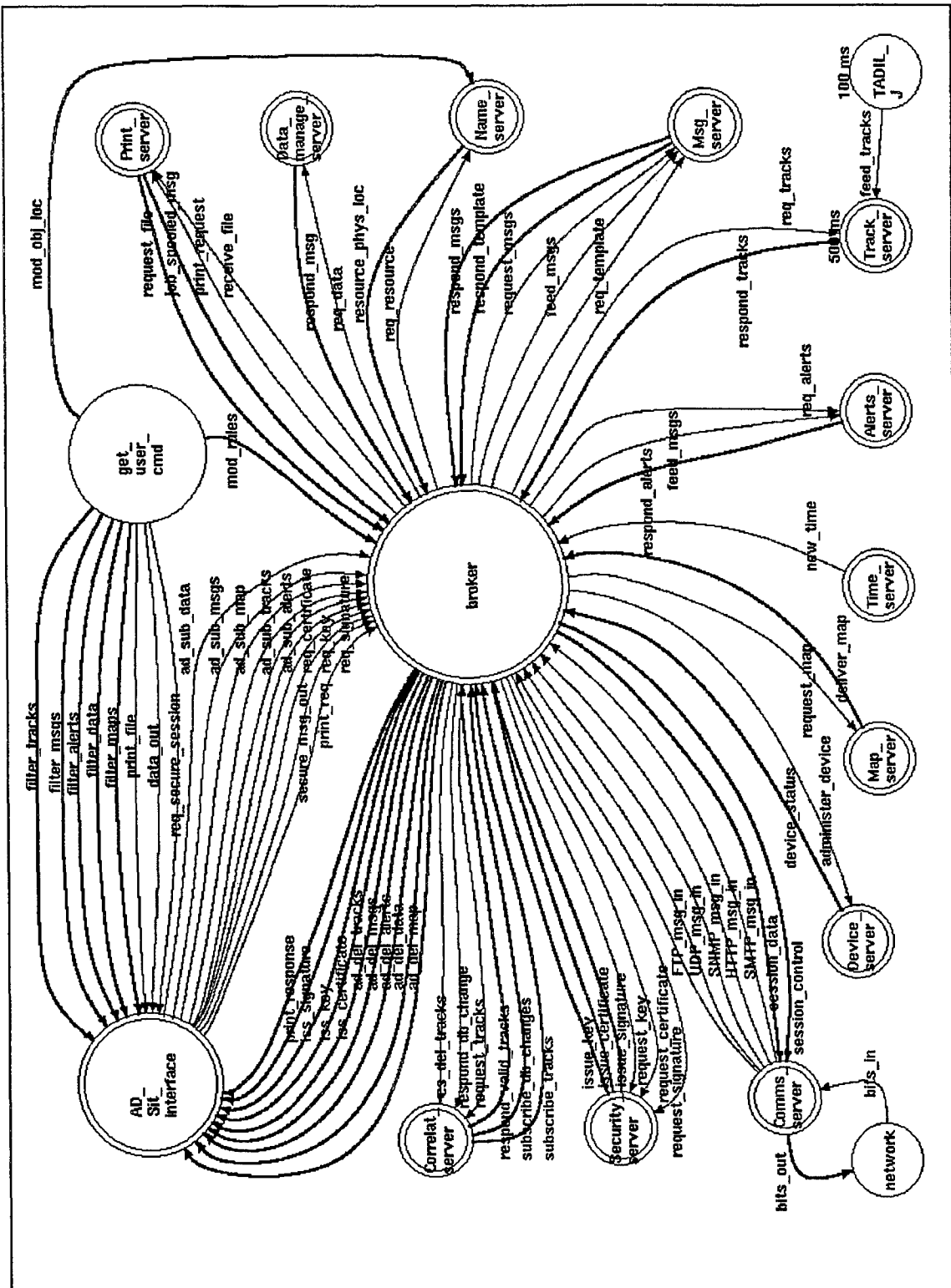


Figure 4. CAPS SAAWC Prototype

packaged in a track file which is transmitted periodically. A final additional operator, `get_user_cmd`, would be implemented in a Graphical User Interface (GUI) programming tool, such as the TAE<sup>1</sup> and would be the means by which the executing prototype interacted with the user utilizing the standard input and standard output streams for communication.

The logic behind the selection of particular data streams for implementation at the high-level SAAWC, to carry messages between the specified composite and atomic operators, resulted from the previous analysis of the functionality of the operators themselves. Examination of the ADSD functionality, for example, identified the need to accept from a user requests to process and archive "filters", or requests, representing tracks, messages, alerts, database records, and map displays pertinent to the prosecution of specific user tasks. Data streams for each of these messages, as well as data streams to carry composed messages, print requests, and requests for secure communications sessions, were identified and drawn to convey the information required for the user to elicit the desired behavior from the prototype. At this level of the ADSD operator, moreover, it is assumed that some sort of internal processing would take place. This processing might consist of validation of these message requests or of archival and modification of locally maintained filters prior to transmission of the messages, intact, to the Broker operator. This internal processing is elaborated upon in the section describing the decomposition of the ADSD composite operator.

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<sup>1</sup>TAE is a trademark of the National Aeronautic and Space Administration.

The Broker operator is the critical archiving, controlling, and validating component in the three-tier architecture. At the highest-level, the complexity of its decision-making is hidden. The operator was drawn to convey the transmission of messages, triggered upon receipt of messages from various originating operators, to the appropriate destination operators. In fact, all outgoing data streams were drawn at this level as responses to the associated incoming data streams. For example, an incoming request to subscribe to the Map Server generated a request to the Map Server, which in turn generated a message containing either the map location or the map itself, triggering a Broker message to the requester which would contain the map itself. One additional data stream was drawn to carry Broker configuration information from the user to the Broker. Implementation of this functionality would permit a user to directly influence the decision-making logic of the Broker, determining such things as priority of delivery of tracks, validation of service requests of particular clients, and discrimination of duplicate or time-late information from a server.

The Alert Server composite operator was drawn with two inputs: messages containing track information, and user-generated requests to set a filter for specific track information. A single data stream output, an alert, would be generated by a successful reconciliation between an internal track message database and a particular filter request. This reconciliation process, amplified by the Alert Server decomposition, would be triggered by the receipt of either a new track message or a new filter request message.

Similarly, the Track Server composite operator was drawn to indicate message

inputs from two sources: the TADIL\_J operator and the Broker operator. Messages coming from the Broker represent user-generated requests for specific "tracks", and the messages coming from the TADIL\_J operator represent the actual tracks themselves. The Track Server would encapsulate the behavior necessary to reconcile requests for tracks against an internally managed track repository, responding to successful matches with a corresponding message to the user.

The Communications Server composite operator was drawn to be the interface between the SAAWC itself and the external network. To this extent, the Communications Server operator is illustrated receiving messages from, and delivering messages to, the network operator. Additionally, data streams representing unpacked FTP, HTTP, SMTP, SNMP, and UDP messages were drawn from the Communications Server operator to the Broker operator, indicating some internal processing of the network generated messages prior to their routing to the appropriate destination. This processing might include extracting the TCP/IP application packets, verifying them for correctness, assembling complete messages, or perhaps validating timeliness of delivery. Finally, two data streams are drawn from the Broker operator to the Communications Server operator: the first, `session_data`, represents a SAAWC user-generated message destined for an addressee outside the SAAWC network, and the second, `session_control`, represents a SAAWC user-generated control message indicating a desire to set up a particular TCP/IP application session between the originator and a specified destination. For example, a user generating an HTTP request for the first time might in fact generate two messages, the

first telling the Communications Server to establish a "thread" of communication between the user and the local HTTP server, perhaps acting in the role of a "proxy" WWW server, while the second message would contain the contents of the page, or resource, request itself.

The Device Server and Map Server are composite operators drawn with highly refined, single-purpose functionality. A data stream from the Broker operator to the Device Server represents an administrator-generated message to add, modify, or perhaps delete a physical device resource to, or from, the network. The outgoing device\_status message is both an indication to the administrator of the success of the device installation, as well as a trigger to the Name Server composite operator to modify its Name database so that user-generated requests to utilize a particular resource are properly mapped to the actual location of that physical device.

The Map Server composite operator is drawn in a similar manner, illustrating the generation of a map message, containing the map itself or perhaps a reference to a map file that is physically located elsewhere. This is triggered in response to an incoming message, request\_map, representing a user-generated request to receive a particular display background for local manipulation.

The Correlation Server composite operator encapsulates functionality for providing "intelligence", or added value, to the tracks processed in the SAAWC. For this reason, the Correlation Server operator was drawn to illustrate "black box" processing of incoming tracks and filter track requests, just as the Alert Server and Track Server

operators were. But the Correlation Server operator was also drawn to indicate an outgoing message subscription to the Data Management Server. A corresponding incoming data stream, `respond_db_change`, represents the Data Management Server's message response containing the requested database record information. It is presumed, at this level, that some unspecified internal processing exists to correlate track information with database record information and that successful matches will be delivered to the user, via the Broker operator, on the `respond_valid_tracks` data stream.

The Data Management Server is a composite operator providing functionality to query, modify, add, and delete database records in response to user requests. In order to simplify the interface presented to potential clients of the Data Management Server, the operator was drawn with a single incoming data stream, encapsulating the request attributes, such as database record type, index, and request type. It is presumed that some internal processing of the messages, to extract and route the requests to the designated atomic operators, is provided. A single corresponding outgoing data stream represents the success of the user request and, if appropriate, the results of the request.

The Message Server composite operator is envisioned to be an archival service for the management of incoming and SAAWC user-generated USMTF messages. Not unlike the Alert Server, Track Server, and Correlation Server, the Message Server operator is drawn to convey some internal processing of the incoming messages it has subscribed to receive, as well as the incoming message filter requests generated by the ADSD client. A corresponding outgoing data stream, `respond_msgs`, represents matches made between the

received and requested messages. Additional functionality has been incorporated into the Message Server, however, to provide for message template service to the ADSD client. It is presumed that an internally managed template database would be available to users requesting message templates, via the `respond_template` data stream, by serving up a formatted file, or a reference to a formatted file, with which the user could initiate the message-generation process.

The Name Server composite operator provides critical, single point, logical resource to physical location mapping. In the absence of such an implementation each client, including every server acting in a client capacity, would require local updating on every occasion that a new resource was added to the system. Such a scheme would quickly become unmanageable. Two incoming data streams, `req_resource` and `mod_obj_loc` respectively, correspond to client-generated requests for resources and to administrator-generated messages effecting changes to the locations of those resources. The lone outgoing data stream, `resource_phys_loc`, carries the information needed to effect communication with the resource itself, or, in the case of a file resource, initiate the file transfer process.

The Print Server composite operator was illustrated to reflect incoming print requests and corresponding outgoing print job spooled messages. Additionally, it was presumed that print requests might be one of two varieties: existing text, map, or graphic files, or screen grabs. To account for the former case, the data stream `request_file` was drawn to represent a message to the Name Server for file location information, and the



data stream `receive_file` drawn to represent the corresponding response. To account for the latter case, some black box processing is presumed for the acquisition of ADSD display parameters and the building of a file into the appropriate format for printing.

The Security Server is a composite operator encapsulating the functionality necessary to provide secure communication sessions which preserve the secrecy, integrity, and authenticity of the session content. Incoming data streams, representing user-generated requests for certificates, keys, and signatures, were drawn to depict the initiation of a secure session, on behalf of any client to any other client or server, with the corresponding `issue_key`, `issue_certificate`, and `issue_signature` data streams drawn to represent the Security Server operator's responses. Internal processing is presumed at this point to include at least the generation, archival, and processing of all certificates, keys, and signatures, required by the ADSD client and system servers in the course of conducting communication sessions.

Finally, the Time Server operator is drawn as a composite operator with the functionality to produce periodic timestamps, represented by the data stream, `new_time`, which are then used by the Broker operator to orchestrate the message receipt, course of action prosecution, and message-generation upon which the entire system relies for efficient and predictable behavior. Decomposition of the Time Server operator is expected to reveal the functionality required to develop and operate a global clock, capable of generating accurate, fault-tolerant system timestamps.

## 2. Air Defense System Display (ADSD) Decomposition

The ADSD, presented in figure 5, was decomposed to incorporate the functionality necessary to retain locally managed state for user-defined track filters, database record filters, message filters, map display filters, and alert filters. The provision of atomic operators which maintain the state of a user's outstanding filter requests allows for efficiencies to be implemented at the ADSD level. For example, were a user to request track information on all F/A-18s in a particular air sector over a given 15 minute period of time, and then follow that up with a request for track information on all F/A-18s in the same air sector over a 30 minute period, rather than build a new filter to manage incoming tracks which meet this new description, the atomic operator responsible for managing track filters, `track_display_db` in the prototype, would reconcile the time fields of the original filter request and generate a subscription message intended to reflect this modification to the Broker and Track Server operators. Locally maintained state can also reduce message traffic within the system by validating user-generated requests denying, for example, requests which are redundant, incomplete, or unachievable within established time constraints. Each of the five filter request operators are drawn to indicate the receipt of filter modification messages, the self-generation of those messages back to the operators to indicate an effected change of state, and the generation of new subscription messages intended to indicate to the appropriate service a change in the desired service requests.

A `security_manager` atomic operator was developed to incorporate the



functionality required by a user desiring the initiation of a secure session with another client or server. The operator was drawn to illustrate the triggering of independent requests for the components of a secure session: certificates, keys, and signatures. These requests are based upon incoming messages stored in the `msg_out` data stream which are generated by the user developing content, for example, USMTF messages or e-mail, intended for transmission to a designated recipient. The content would be held pending arrival of the secure components, indicated by the `iss_certificate`, `iss_key`, and `iss_signature` data streams, whereupon the `security_manager` operator self-generates state modification messages, wraps the content accordingly, and places the resulting secure message on the outgoing data stream `secure_msg_out`. Efficiencies achieved by a locally maintained state operator, such as `security_manager`, include the reuse of existing certificate, key, and signature information during multiple secure sessions between the same parties, and the validation of secure session requests based upon predetermined rules for session requests with specific destination clients and servers.

A final ADSD functionality is illustrated with the `print_manager` atomic operator. A stateless operator, the `print_manager` would process print requests ensuring, for example, that the requests were properly formatted, addressed, and prioritized. The corresponding message, `print_response`, would be processed with information being displayed to the user indicating the result of the print request and, perhaps, amplifying information on the handling of the print request by specific printing devices.

### 3. Alert Server

The Alert Server, presented in figure 6, is decomposed into three atomic operators. The `alerts_update_filter` operator incorporates the functionality required to retain knowledge of all received alert requests. The state maintenance of this atomic operator is indicated by the self-generated state stream, `alerts_filter`, which is triggered by an incoming message, `req_alerts`. The `alerts_filter` state stream both modifies the internally managed database of alerts requests and carries the most recent alert filter request to the operator `resolve_alerts`, itself responsible for resolving existing alert filter requests with incoming messages. The atomic operator `resolve_alerts` receives incoming messages on the data stream `alerts_message_db`, which is triggered in response to the receipt at operator `update_msgs` of incoming messages generated by the composite operator's subscription to the Message Server. Like the `alerts_update_filter`, the `update_msgs` operator maintains state through the self-generated state stream, `alerts_message_db`, which modifies an internally managed database of incoming messages.

The critical resolution process, whereby alert messages are generated and put on the `respond_alerts` data stream, is encapsulated in the `resolve_alerts` operator which itself is triggered upon receipt of messages from either of the `alerts_update_filter` operator or the `update_msgs` operator. One note on the potential implementation of the `alerts_update_filter` operator: in order to preserve modularity and independence in the development of client operators, this operator should be completely unaware of which clients are requesting which particular alert filters. Instead, this operator maintains

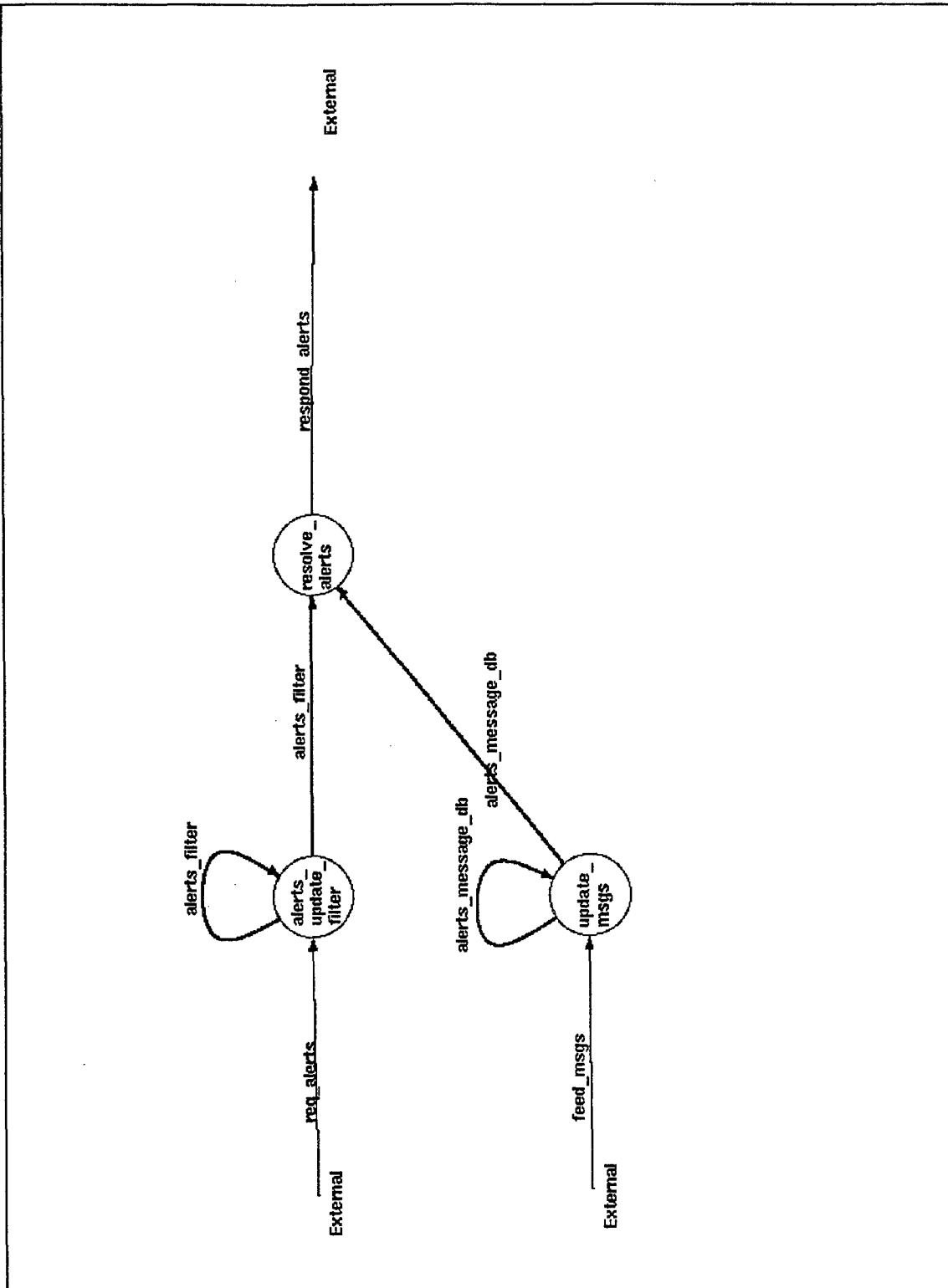


Figure 6. Alert Server Operator

knowledge only of what messages are to be monitored for the generation of alerts. Such an implementation simplifies the record-keeping required of the `alerts_update_filter` and passes the burden of associating specific requests to particular clients to the Broker operator, where it must reside in order to allow development of an Alert Server which has no knowledge or dependence on potential client implementations.

#### **4. Broker**

The Broker operator, presented in figure 7, is decomposed into three atomic operators. The `client_thread_manager` operator processes requests from clients, or servers acting as clients, either constructing new threads, modifying existing threads, or destroying threads in response to those requests, and puts responses to those requests for service on the data stream `client_req`, as appropriate. This data stream is drawn as a state stream, indicating that the message on the data stream is used not only to trigger the `business_rules_manager` operator, but also to modify the state of the internally managed client thread database. The `client_thread_manager` also receives the data stream `valid_srv_response`, representing a response to a client request for service. It processes the content of this message, updating the record-keeping associated with that particular client request, and forwards the message on the relevant data stream corresponding to the initial request.

The `business_rules_manager` atomic operator is where the "personality" of the entire SAAWC system resides. This is the operator which contains the intelligence to adjudicate client-generated requests for service, validating not only client requests but also





server responses, prioritizing delivery of those responses to real-time and non-real-time clients alike, and correlating requests for specific types and values of information to reduce the number of duplicate transmissions throughout the network. The `business_rules_manager` operator processes the `client_req` data stream and responds to valid requests by generating the `valid_client_req` message to the `server_thread_manager` operator. Similarly, it processes the `srv_response` data stream and responds to valid server responses by generating the `valid_srv_response` message to the `client_thread_manager`. The `mod_rules` data stream represents the interface between the system administrator and the system for effecting modifications to the set of rules for determining system-wide prioritization, validation, and domain-specific logic. The `mod_rules` data stream is represented as a state stream, indicating self-modification of the state of the `business_rules_manager` operator through the content of this data stream.

The `server_thread_manager` atomic operator functions much as the `client_thread_manager` operator does, maintaining a database of all current subscription threads to system servers, each thread referencing a capsule of data attributes which indicate the status, originator, destination, and message content associated with a thread session. The operator updates itself through the state stream `srv_response`, a copy of which is also passed to the `business_rules_manager` for content validation.

## **5. Communications Server**

The Communications Server operator, presented in figure 8, is decomposed into two sets of TCP/IP application processor operators, two network interface operators for

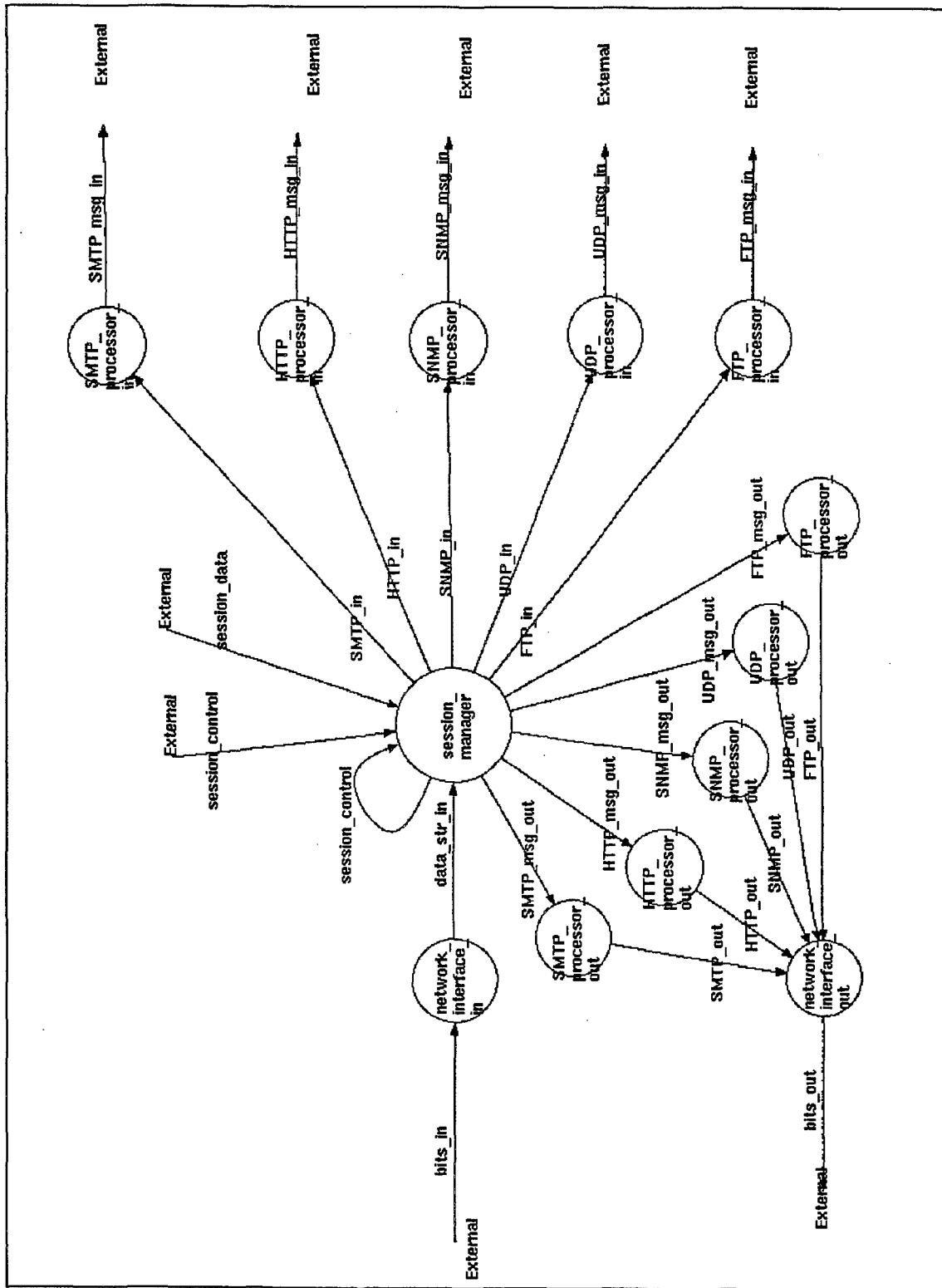


Figure 8. Communications Server Operator

handling messages delivered to, and received from, the network, and a session\_manager atomic operator which manages the establishment and maintenance of TCP/IP application sessions initiated by the ADSD client. The two sets of TCP/IP application processors represent a subset of the larger group of TCP/IP application protocols in use today. The Simple Mail Transfer Protocol (SMTP) provides for simple management of e-mail client and server operations, the Hyper Text Transfer Protocol (HTTP) is a mechanism by which World Wide Web pages are transferred from servers in response to client requests, the Simple Network Management Protocol (SNMP) provides a means for the monitoring and management of network operations, the User Datagram Protocol (UDP) is used for connectionless data transfers in which dropped packets can be tolerated, and the File Transfer Protocol (FTP) provides a mechanism and a set of commands for effecting the transfer of files between nodes on the network.

Each of these protocols is represented by both an outgoing process operator and an incoming process operator. The outgoing process operators take client-generated messages and package them for transmission on the network. Protocol-specific message segmenting, labeling, and prioritization are among the potentially implementable activities at this level. The incoming process operators receive the respective protocol encapsulated packets, strip the protocol header information from the messages, reconstitute the messages into their original, pre-transmission state, and forward the messages to the addressed destination.

The network interface atomic operators implement specific network datalink-layer

functionality, packing and unpacking, segmenting and reconstituting, transmitting and retransmitting packets as necessary. The characteristics of datalink-layer transmission protocols, such as IEEE 802.3 or IEEE 802.5, would be simulated at this level in order to evaluate potential performance bottlenecks or constraints within the network. Finally, the session\_manager atomic operator would manage and archive session requests in response to the user-generated requests for new sessions arriving on the session\_control data stream. This data stream is implemented as a state stream, modifying the internally managed database of TCP/IP application sessions. The incoming session\_data data stream carries the content of the session-specific request which may, in the event the content references an FTP session, for example, contain the commands and arguments required to initiate a file transfer between client and server.

## **6. Correlation Server**

The Correlation Server operator, presented in figure 9, is decomposed into five atomic operators. Three operators implement the functionality of receiving archival messages, and of triggering self-generated responses which modify the internally managed state of the operators, while simultaneously putting the responses on outgoing data streams destined for a correlation processor. The three operators identify functionality for the archiving of track requests, database records, and tracks developed from sensor-derived information distributed throughout the network. The first of the two correlating operators, correlate\_tracks, reconciles incoming tracks with database records in order to produce a "value-added" track with some higher degree of assurance as to the

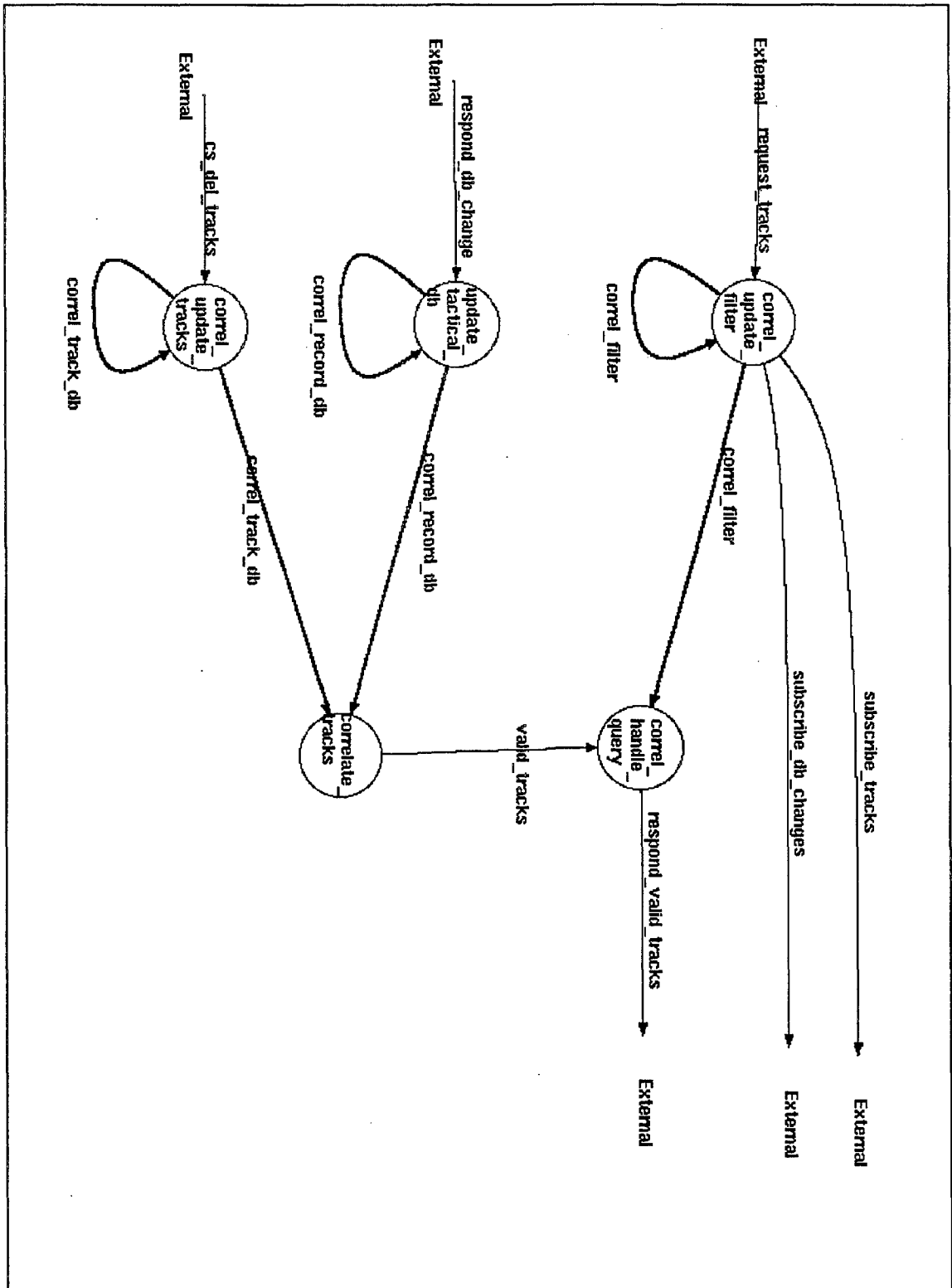


Figure 9. Correlation Server Operator

track's authenticity. The second correlating operator, `correl_handle_query`, reconciles the value-added tracks with user-generated track requests, responding only with matches which represent the identification of a particular track, or set of tracks, of interest to the user. Finally, and as previously described, the two data streams, `subscribe_tracks` and `subscribe_db_changes`, represent requests from the Correlation Server to subscribe to the Track Server and Data Management Server in order to continually receive new track and database record information, reflecting both the dynamic nature of the rapidly changing battlefield and the changing needs of the ADSD operator.

## **7. Data Management Server**

The Data Management Server, presented in figure 10, incorporates the functionality to determine the data type and request type of a particular data management request before passing the message content to a particular DBMS for action. Three DBMS types, an object DBMS, a conventional record DBMS, and a file DBMS, are specified in the Data Management Server as a collection of independent processes acting on requests for querying, modifying, adding, and deleting the request contents from the respective DBMSs'. Each DBMS consists of four similar atomic operators, each of which is triggered by a message received from the `resolve_request_type` atomic operator. With the exception of those atomic operators handling DBMS queries, or record retrievals, each of the DBMS atomic operators generates a state stream, for the purpose of self-modification, as well as generating an outgoing data stream, corresponding to the triggering input stream, which carries the result of the DBMS request back to the request

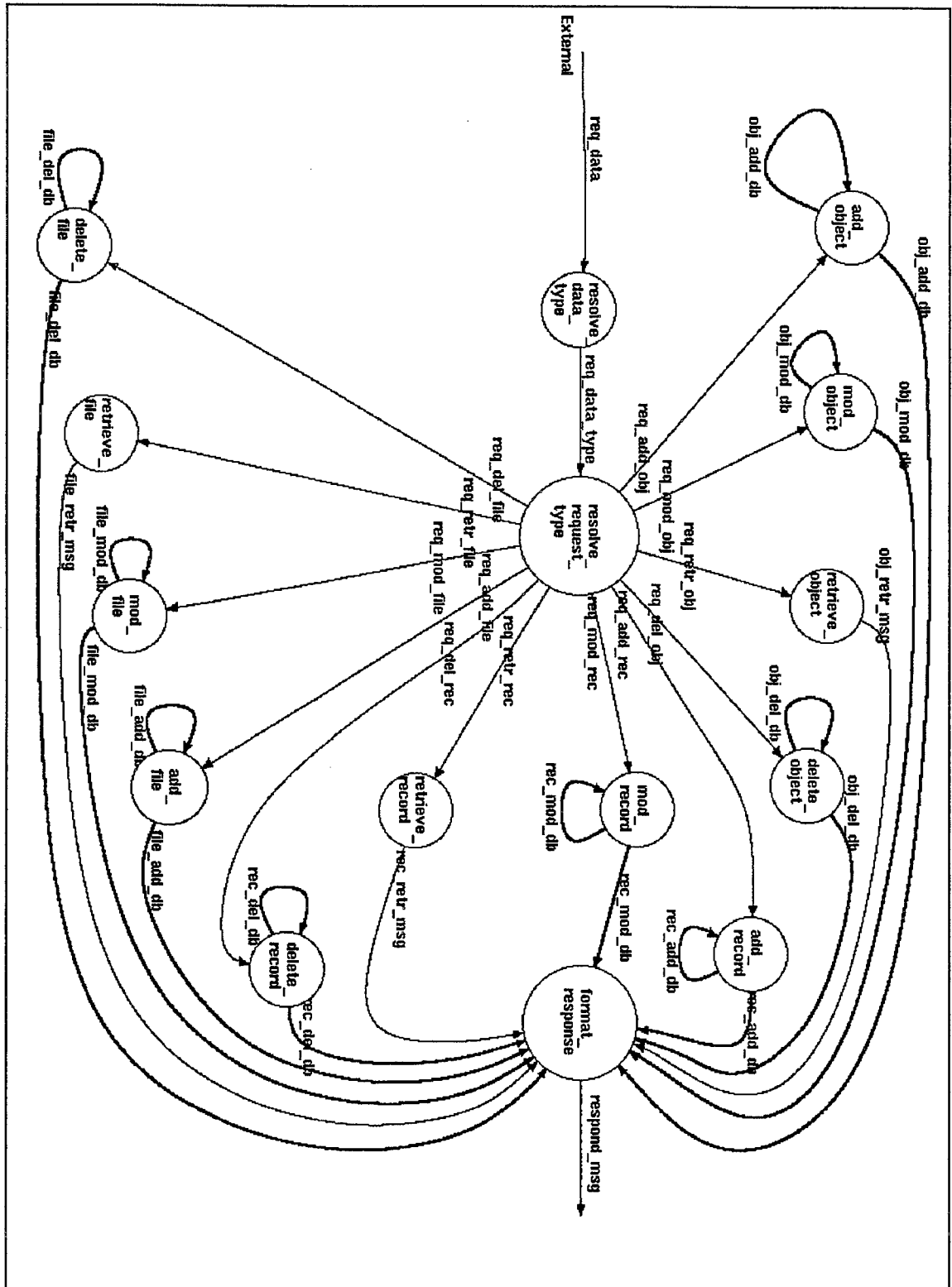


Figure 10. Data Management Server Operator

originator. All responses to DBMS requests are passed from the DBMS atomic operators to the `format_response` operator which packages the response in a DBMS-independent format for further transmission to the request originator.

The `resolve_data_type` atomic operator is illustrated as a process which receives the initial requests for DBMS action, determines the appropriate DBMS for service, and forwards the resolved request to the `resolve_request_type` atomic operator. An implementation of the `resolve_request_type` atomic operator would be made aware of the available DBMS methods through contact with each DBMS's published interface and would be responsible for invoking the correct method based upon the resolved request type indicated in the incoming `req_data_type` data stream.

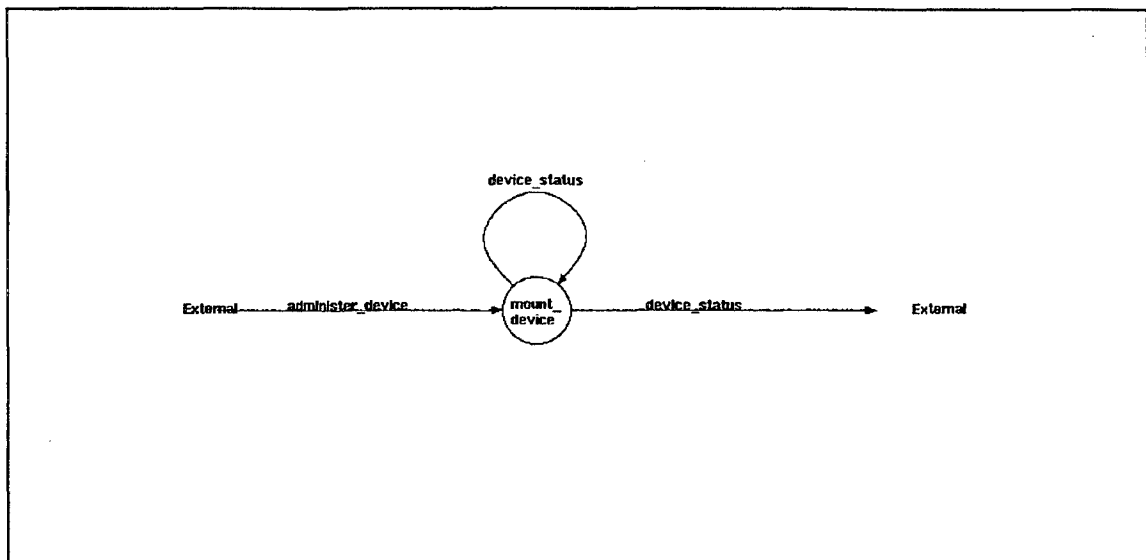
A sample transaction, to delete a conventional database record from a database, would proceed as follows: the request would be identified as carrying data type database record in the `resolve_data_type` atomic operator; the request would be identified as request type delete database record in the `resolve_request_type` atomic operator; the delete database record request would be forwarded to the `delete_record` atomic operator where the record deletion would be effected, and a corresponding request status message would be generated; the request status message would be processed by the `format_response` atomic operator where it would be stripped of any DBMS-specific packaging and formatted for transmission to, and processing by, the request originator.

## **8. Device Server**

The Device Server, presented in figure 11, is decomposed into a single, simple



atomic operator, mount\_device. Triggered by the incoming data stream, administer\_device, an implementation of the mount\_device operator would retrieve the configuration file referenced in the administer\_device message and apply the appropriate device driver information to enable the device on the network. Alternatively, the administer\_device data stream could carry information indicating the removal of a referenced device from the network. In the latter case, the device\_status message would



**Figure 11. Device Server Operator**

be transmitted to the Broker with a value of false, indicating to the Broker operator the removal of the device from the network. The Broker operator would generate a corresponding message to the Name Server, which would update its table of logical to physical resource mappings accordingly. A value of true on the device\_status data stream would indicate to the Broker operator the addition of a device to the network, in this case causing the Broker operator to generate a message to the Name Server for the appropriate modifications to its table of logical to physical resource mappings.

## 9. Map Server

The Map Server, presented in figure 12, also is functionally decomposed into a single atomic operator, `locate_map`. This operator is triggered upon receipt of the incoming `request_map` data stream, the contents of which reference a logical map or image requested by the ADSD client. An implementation of the `locate_map` atomic operator would map the referenced map or image to an actual map or image file and then initiate a file transfer to deliver that file to the ADSD client for display.

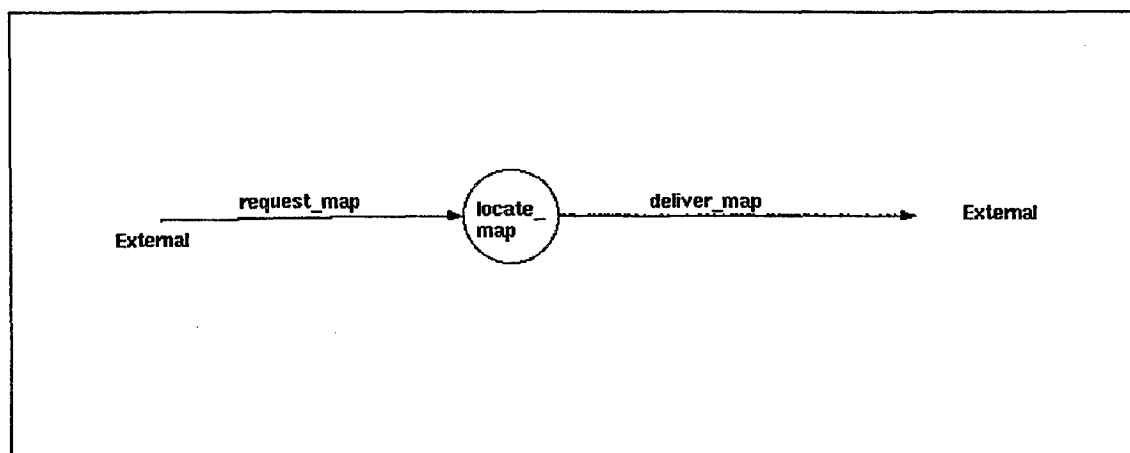


Figure 12. Map Server Operator

## 10. Message Server

The Message Server, presented in figure 13, is functionally decomposed into four atomic operators: three are associated, respectively, with the archiving of incoming messages, requests for messages, and the matching of the two; the fourth atomic operator, `template_database`, responds to user-generated requests for message templates by searching an internally managed database of templates, then responding on the outgoing data stream, `respond_template`, with the requested message template.

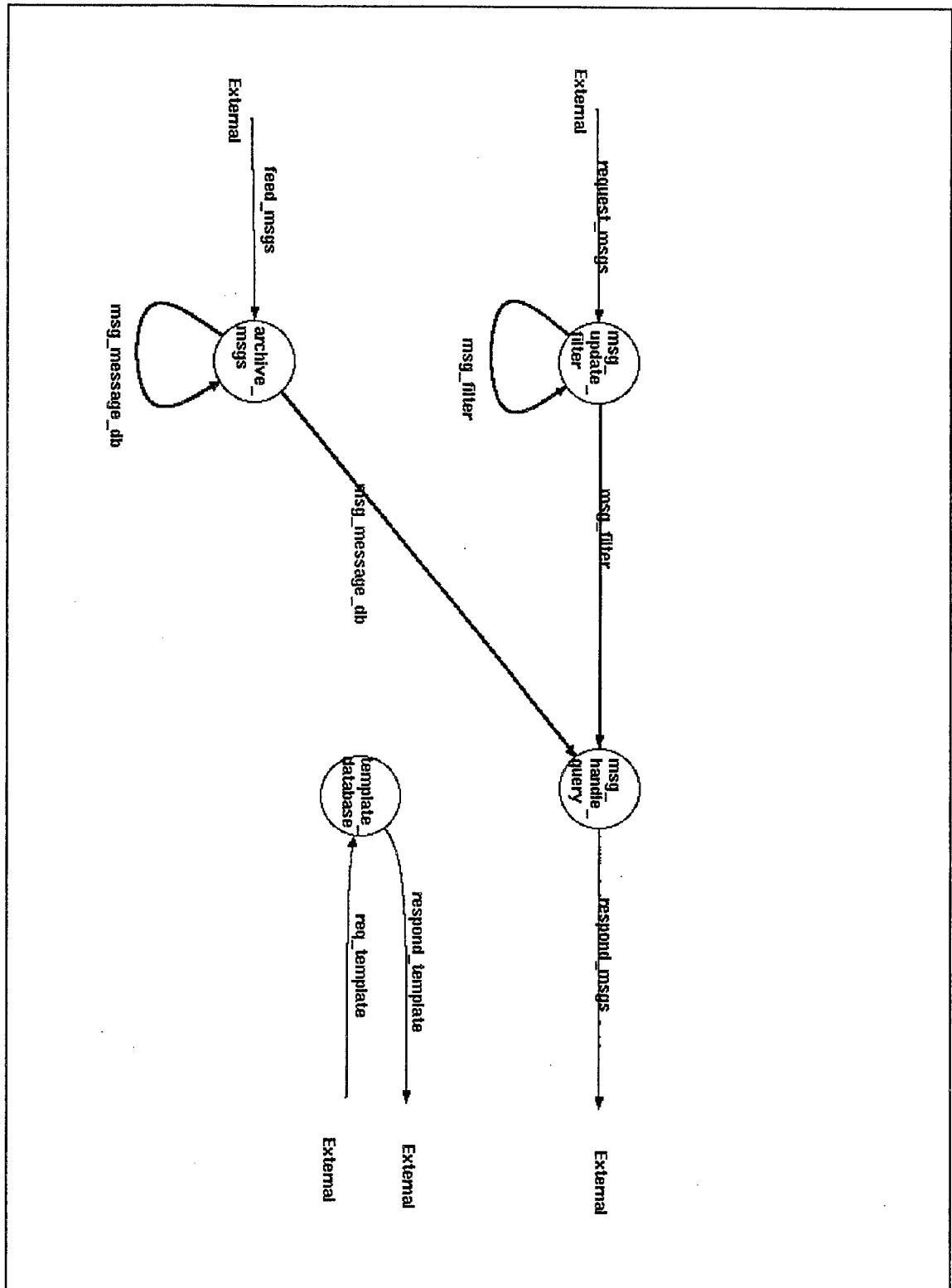


Figure 13. Message Server Operator

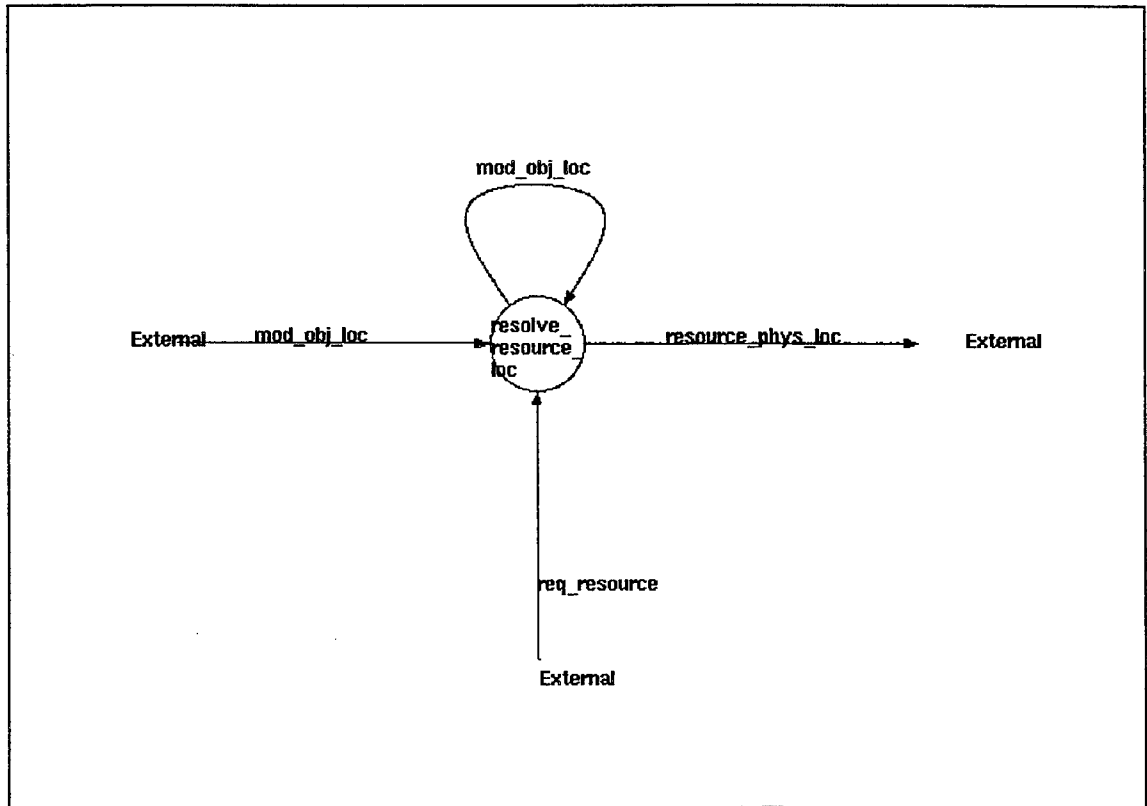
The `msg_update_filter` atomic operator provides the functionality for the archiving of message filter requests, in the same manner as the `alerts_update_filter` atomic operator in the Alert Server. Message requests are delivered on the incoming data stream `request_msgs`, triggering a corresponding state stream `msg_filter`, which updates the operator itself and notifies the `msg_handle_query` atomic operator of the new filter request via the `msg_filter` data stream. The `archive_msgs` atomic operator provides identical functionality to that described in the `update_msgs` atomic operator of the Alert Server. It receives incoming messages, generates a self-modifying state stream, `msg_message_db`, and puts a copy of the new message on the `msg_message_db` data stream delivered to the `msg_handle_query` atomic operator. This operator encapsulates the functionality found in the `resolve_alerts` atomic operator of the Alert Server, which is to match incoming requests for messages against the actual incoming messages themselves. Matches result in an outgoing data stream, `respond_msgs`, which delivers the matched message to the requesting client via the Broker.

## **11. Name Server**

The Name Server, presented in figure 14, plays a critical role in the distributed network because it represents a single point of reference, mapping logical names to physical locations, facilitating the addition, removal, and location modification of all distributed network system resources. In the SAAWC prototype it is functionally decomposed into a single atomic operator, however, disguising the underlying complexity which would exist in any full implementation of a Name Server, such as the Domain Name

System (DNS), or an X.500 compliant directory service.

The `resolve_resource_loc` atomic operator is triggered by incoming additions, deletions, and modifications to the locations of system resources which are carried on the



**Figure 14. Name Server Operator**

incoming data stream `mod_obj_loc`. State stream `mod_obj_loc` is generated as a response, and it accomplishes the updating of the internally managed resource database. The incoming data stream, `req_resource`, represents the client-generated request for a particular resource. The corresponding generated response is the data stream `resource_phys_loc` which consists of a message indicating the physical location and proper name of the requested resource. This would then be used by the Broker to initiate a method invocation, data type retrieval, or file transfer on behalf of the client in order to

effect the desired results and complete the requested transaction initiated by the corresponding client. An example of such a transaction might be the request for retrieval of a particular map to be displayed by the ADSD client.

## **12. Print Server**

The Print Server, presented in figure 15, is functionally decomposed into three atomic operators. There are potentially two kinds of print requests: those involving files of some type, whether opened for reading or writing or even as temporary files serving as "buffers" or "pipes", and those involving a screen capture or "frame" in a video display. The `check_for_file` atomic operator receives the incoming `print_request` data stream and determines which of the two print request types is being referenced. If the `print_request` references an existing file, then a corresponding `request_file` data stream, bearing as content the logical name of the requested file, is generated and forwarded to the Broker for name resolution and eventual file location and transfer. The requested file is received on the incoming `receive_file` data stream, and a corresponding file data stream is then generated, carrying the referenced file to the `spool_file` atomic operator for subsequent delivery to the appropriate printing device. The `spool_file` atomic operator generates a corresponding outgoing data stream, `job_spooled_msg`, which can contain information pertaining to the print job such as the servicing printer, position of the job in the print queue, number of pages in the print job, and so on. In the event that a print request is determined to be referencing a screen grab, the pertinent screen parameters are extracted from the print request message by the `check_for_file` atomic operator and

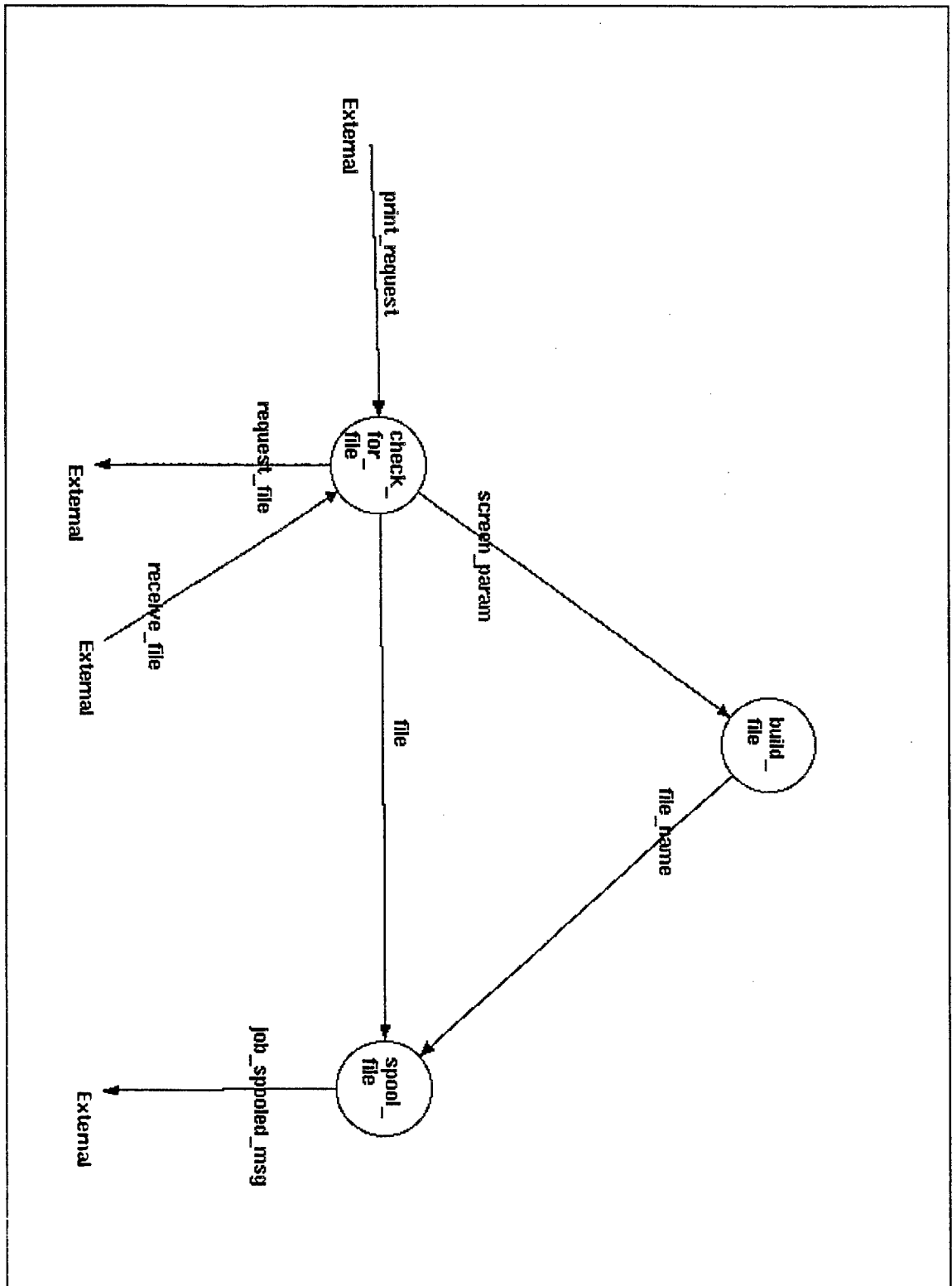


Figure 15. Print Server Operator

forwarded on the outgoing screen\_param data stream. The build\_file atomic operator opens a file for writing and proceeds to create a printable file depicting the referenced display. The file name is forwarded on the outgoing file\_name data stream to the spool\_file atomic operator where the print request is finally resolved and the print job initiated.

### **13. Security Server**

The Security Server, presented in figure 16, is functionally decomposed into three independent atomic operators: validate\_certificate, validate\_key, and validate\_signature. Implementations of each would validate requests for their respective security mechanisms, search an internally managed database for the appropriate component, and respond on an outgoing data stream with the requested security measure. The respective outgoing data streams for each of the atomic operators are also represented as state streams, which effect modifications to the internally managed databases identifying the issuance of a security measure, the requesting originator, the requested recipient, and other such information as might uniquely describe the particular communication session. Implementations of a Security Server might trigger the issuance of related security measures from the received request of any one component, might contain the functionality to create new security components and discard dated or compromised components, and might also incorporate the functionality to generate alerts to the system administrator in response to unusual requests for security mechanisms.



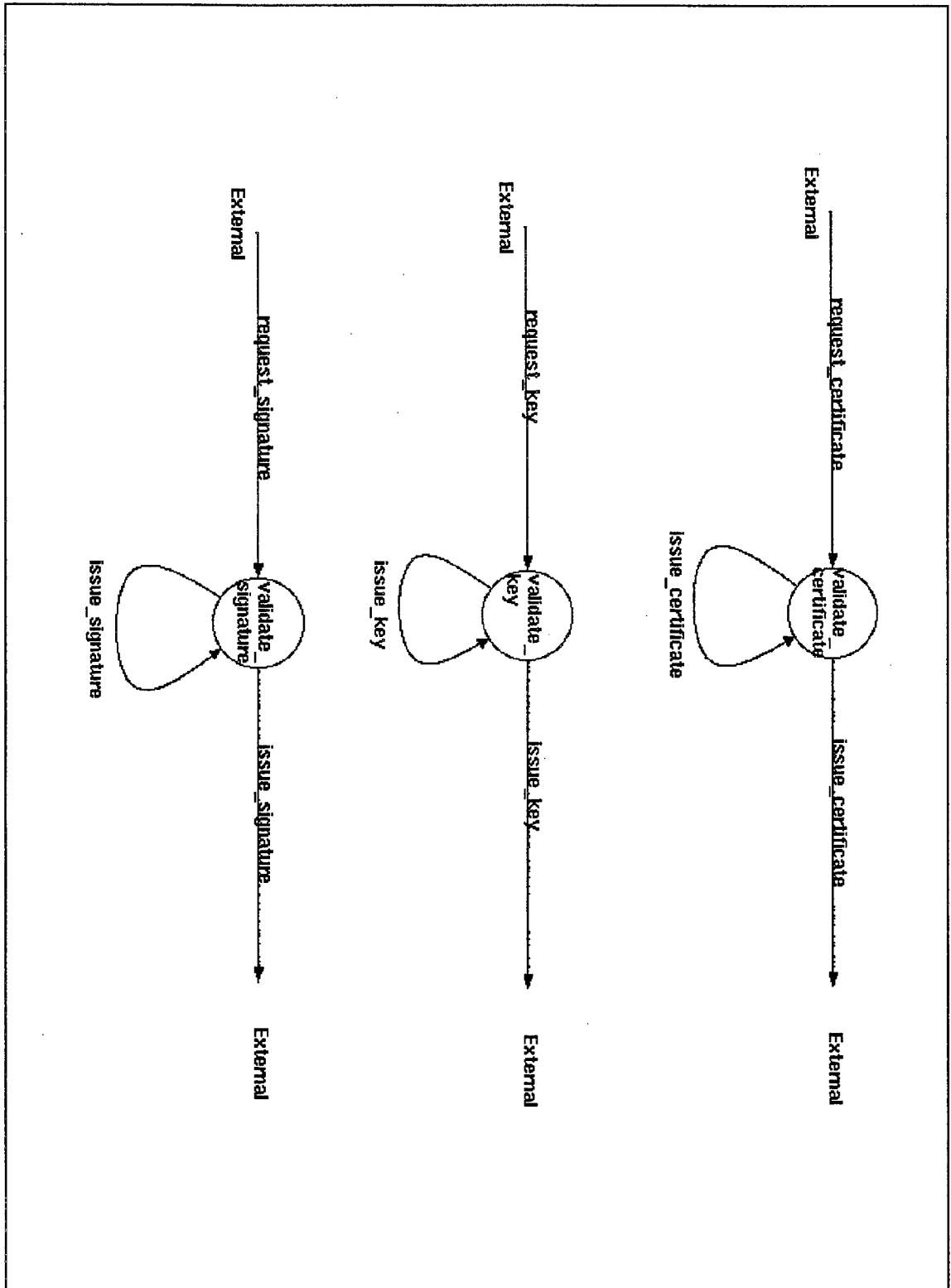
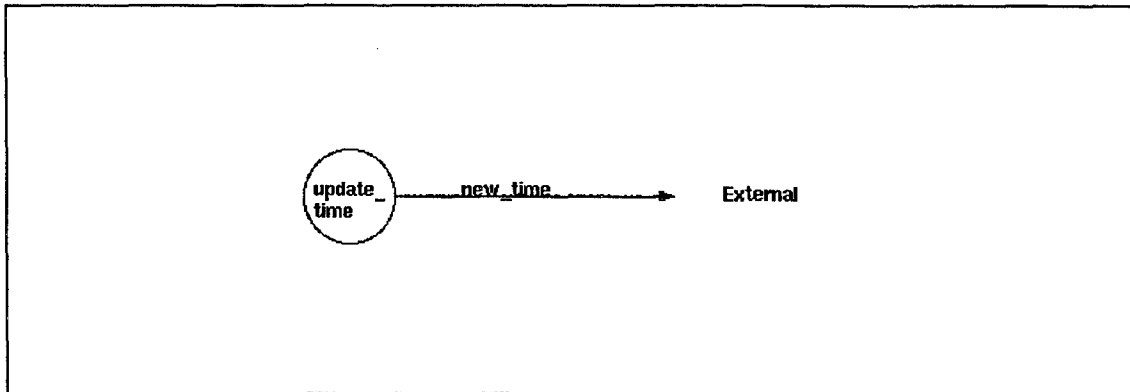


Figure 16. Security Server Operator

## 14. Time Server

The Time Server, presented in figure 17, consists of a single atomic operator,



**Figure 17. Time Server Operator**

update\_time. An implementation of this atomic operator would consist of calls to a system time function and the conversion of that returned result into a timestamp which could then be forwarded to the Broker on the outgoing data stream new\_time. Though functionally simple, the Time Server provides a critical service by making possible the chronological ordering of all system messages, enabling the Broker to enforce the validation and prioritization rules it has inherited.

## 15. Track Server

The Track Server, presented in figure 18, consists of three atomic operators functionally aligned with the atomic operators described in the decompositions of the Alert Server and the Message Server. The update\_filter atomic operator responds to new track requests contained within the incoming req\_tracks data stream by generating a self-modifying state stream, filter, which updates the internally managed database of requested tracks. The receipt of a req\_tracks data stream also triggers the release of a

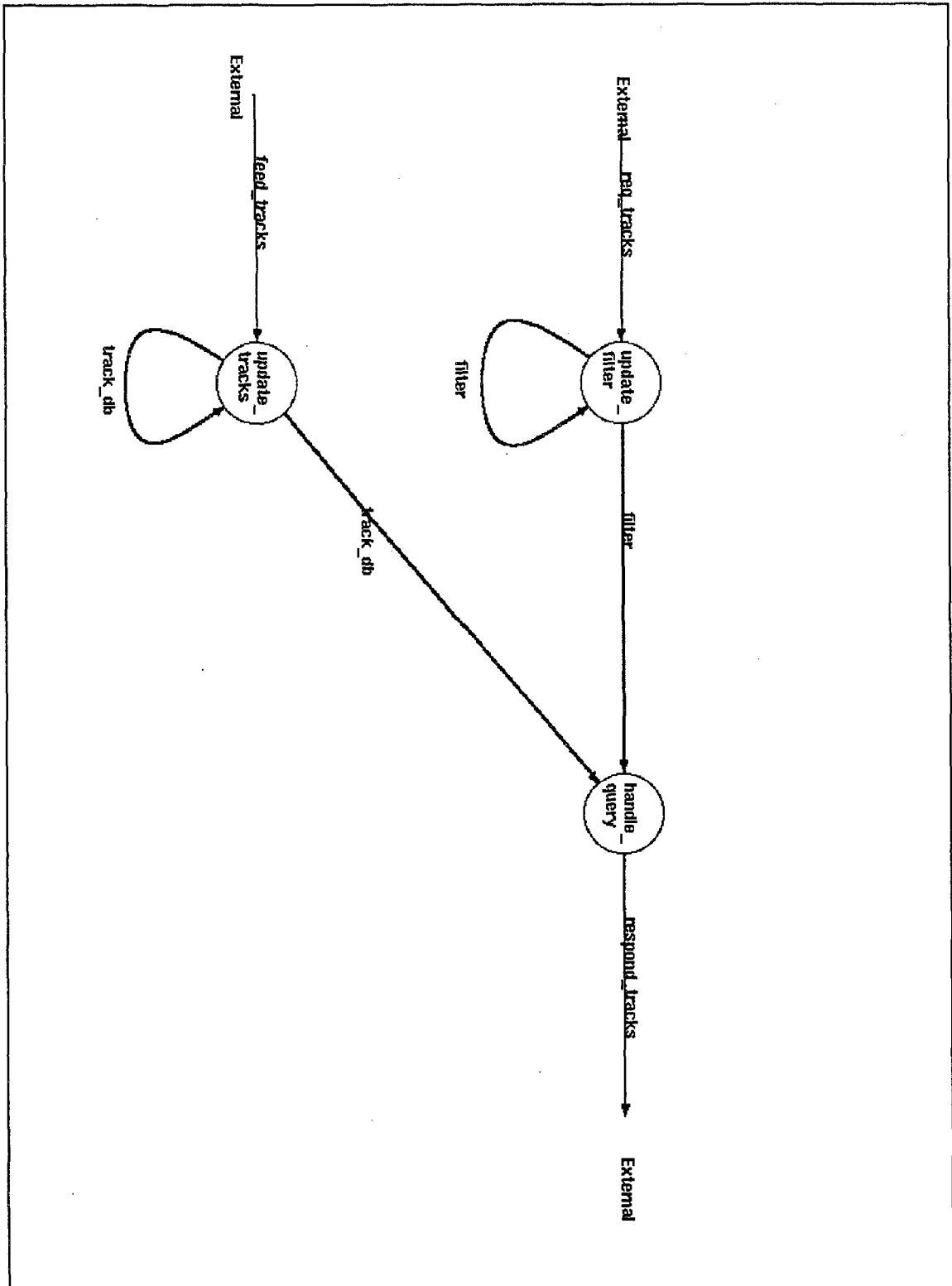


Figure 18. Track Server Operator

message on the outgoing data stream filter, which carries the newly requested track filter to the `handle_query` operator for matching against existing track records. The `update_tracks` atomic operator receives new tracks on the incoming `feed_tracks` data stream, responding with the state stream `track_db` which modifies the internally managed database of tracks, and with the outgoing data stream `track_db`, which carries a message to the `handle_query` atomic operator indicating the existence of the new track. The `handle_query` atomic operator responds to filter data streams and to `track_db` data streams by attempting to match requests for tracks with notifications of existing tracks, responding with successful matches on the outgoing data stream `respond_tracks`. The `respond_tracks` data stream bears the announcement of a matched track and delivers the message, via the Broker, to the client originating the track request.

#### **E. CAPS PROTOTYPE SYSTEM DESCRIPTION LANGUAGE EDITING**

Upon conclusion of the drawing phase of the CAPS prototyping process, the next step was to edit the PSDL code which had been generated by the finished diagrams. All streams designated as state streams in the diagrams, whether to change the state of associated operators or to break existing cycles in the prototype, needed to be identified and declared syntactically within the PSDL code and properly initialized to reflect beginning states. Their declarations as data streams, the default representation for drawn streams, needed to be deleted as well, to prevent duplicate declarations in the PSDL code.

All user-defined data types, contemplated during the drawing phase but first declared in the PSDL editing phase, needed to be syntactically declared and specified as

well. In addition, an operator needed to be specified in the user-defined data type specification to provide default initialization of newly instantiated user-defined objects. All user-defined data types were specified to contain an operator `EMPTY`, which simply returns a reference to a default initialization, implemented in an Ada source code file, of that particular user-defined data type. For the purposes of this prototype, decisions were made to identify a large number of user-defined data types, and to give them names meant to clarify the intended purpose of those data types. The user-defined data types identified and implemented are: `ADMINISTER`, `ALERT`, `BITS`, `CERTIFICATE`, `DB_RECORD`, `DEVICE`, `KEY`, `MAP`, `MESSAGE`, `PARAM`, `PATH`, `SIGNATURE`, `TIMESTAMP`, and `TRACKS`. Figure 19 presents the hierarchy of user-defined data types.

The bottom level contains primitive types and component records which are themselves fields in the composite records of the higher levels. The highest level contains the user-defined data type `BITS`, which is designed to be the composite type containing system messages, and which is formatted to comply with a specific network datalink protocol. Recognizing the principle of specifying Abstract Data Type (ADT) definitions, but omitting the ADT implementations as unnecessary for the purposes of the prototype, most user-defined data types were envisioned to be simple record types consisting of a primitive data type string component which referenced, perhaps, a configuration file which contained the necessary attribute and method information for the instantiation of the identified data type. For example, a `KEY` user-defined data type would consist simply of a name field referencing a particular file containing the information necessary to create a

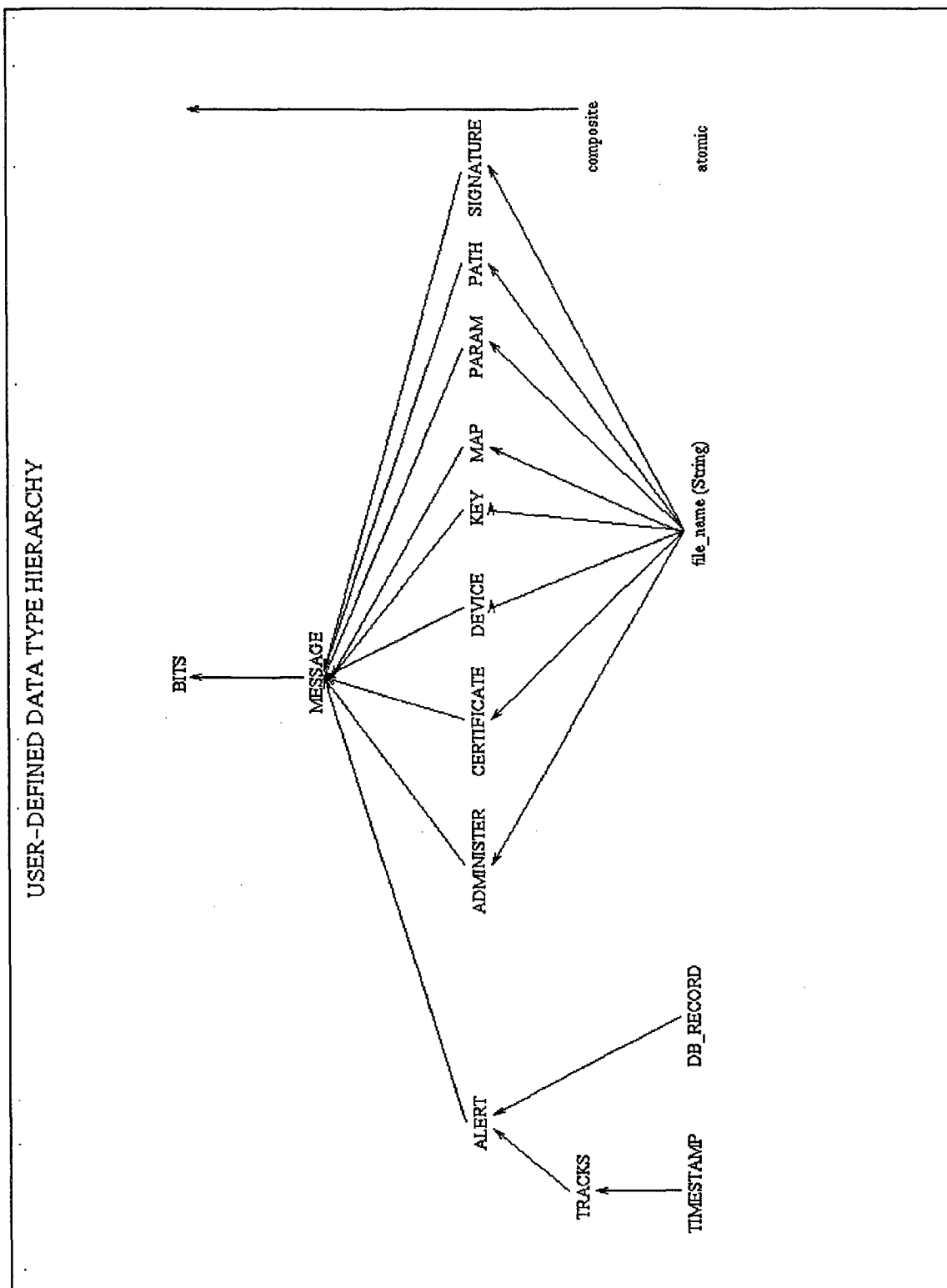


Figure 19. User-defined Data Type Hierarchy

KEY object, which would then be returned to the KEY request originator for use within the system.

Finally, all operator and data type specifications which were not defined as being implemented by decomposed diagrams or primitive types needed to have their source of implementation identified. This was a simple matter of specifying, in the PSDL code, Ada source code implementations for all atomic operators and user-defined data types.

#### **F. TRANSLATING AND SCHEDULING**

Timing constraints and control constraints were not used for the prototype but represent future work for improving the quality of the simulation. As a consequence, the translation process, which produces a compilable Ada source code file to drive the prototype's execution, and the scheduling process, which determines a solution to the problem of scheduling the firing of prototype operators given the set constraints, were enacted and succeeded with no errors.

Future implementation of timing and control constraints would be driven by the compilation and analysis of real world data describing the amount and type of data flow in an actual SAAWC network. For example, data could be collected which documents the number of system-generated tracks or the number of record messages queried and received by a SAAWC operator over a given period of time. Such data could be collected through the monitoring of SAAWC operations during an actual exercise, and could be augmented by the analysis of traffic flow through the network. This latter source of data

is monitored by the communications personnel manning the Communications Systems Control facility.

## **G. IMPLEMENTATION**

Every user-defined data type and atomic operator identified in the PSDL code required implementation in a separate Ada source code file. The majority of user-defined data types were implemented as Ada records, containing a string component which represents a named reference to a configuration or encoded data file, and a Boolean component indicating whether the nature of the message containing the data type is a request or a response. The DB\_RECORD and TRACKS data types were defined as Ada records containing integer, string, and TIMESTAMP components which provide elaborating information on the physical entities they abstract. The ALERT data type was defined as an Ada record which references DB\_RECORDS and TRACKS and provides amplifying information in the form of integer and string components which provide location and time context for the referenced DB\_RECORDS and TRACKS. Finally, the MESSAGE data type was implemented as an Ada record referencing all other non-BIT user-defined data types. Its role in the prototype is analogous to that of a network-specific protocol packet, representing the atomic unit upon which all atomic operators designed to function as interfaces within the network can properly perform receipt, processing, and repackaging operations.

All atomic operators were implemented with the simple functionality of invoking the system stream output operator to print operator-specific messages to the prototype



console text window. Future implementations of the atomic operators would either use off the shelf components to provide the requisite functionality or skeleton code to simulate the expected behavior of the operator. For example, the atomic operators designated to encapsulate the functionality of the DBMS module executing record deletions could be implemented with a commercially available DBMS product or by a simple linked list implementation which effects a runtime-only simulation of database management behavior.

## **H. SUMMARY**

The analysis, design, and implementation of the SAAWC prototype in CAPS involved a number of computing tools and document resources. Satisfaction with the correct, desired, logical decomposition of the model was the result of numerous drawings and protracted analysis with drawing and spreadsheet tools. Familiarization with CAPS itself came with the review of available tutorials and user manuals, and with experimentation on small-scale prototypes. Improvements to the prototype design often came in the wake of articulations of the design philosophy in writing, which occurred during the concurrent editing of this document. Finally, refinement of the prototype design resulted from numerous critical comments from peers and advisors.

## V. CONCLUSION

### A. SAAWC PROTOTYPE SIGNIFICANCE

The need exists to identify redundancy in the development of automated information systems for employment in the conduct of command, control, communication, computing, and intelligence operations both in peace and in time of conflict. The prerequisite for this identification is a thorough examination and analysis of the data types and processes, both common support and task-specific, which exist in a particular operational domain, such as the Sector Anti Air Warfare Center. The SAAWC is a pertinent candidate and an important model for this analysis, as it incorporates much of the functionality exhibited by C4I workstations: consumption of real-time and non-real-time data, dynamic display of operational events in the context of the time and space which they occupy, redundant means of communication incorporating text, graphic, audio, and video representations, powerful rules-based analysis through the identification and presentation of event abstractions and elaborating documentation. Comprehensive and accurate identification of the data types and processes which will enable the functionality identified as required by system operators is a critical first step in the design and implementation of the strictly defined software modules essential to the often touted vision of "plug and play." Comprehensive analysis of these data types and processes will permit the development of well-defined interfaces, which in turn will permit the independent and concurrent development of the common support and task-specific implementations which will satisfy the functional needs of the operator.

## **B. CAPS PROTOTYPING**

Prototyping is a quick, low-risk, cost-effective solution to the problem of developing automated information systems which augment and, increasingly, enable the conduct of C4I operations. The NPS Computer Aided Prototyping System prototyping of the SAAWC facilitated a deliberate, logical analysis of the atomic functionality required to provide those services identified in the SAAWC reference manual as well as those which are in compliance with the DII COE, GCCS, and JMCIS architectural guidelines. CAPS provides an integrated set of tools which permit the specification, design, and implementation of a prototype to occur within a single integrated development environment. CAPS also provides the functionality to propagate changes made to the prototype design in the graphical editor both to the PSDL specification and to the source code file which drives the executing prototype. Together with the integrated schedule writing module, these CAPS capabilities increase the likelihood that a developer attempting to model a distributed, networked system will be able to create a simulation which more closely fulfills the needs of the operational community.

## **C. FUTURE WORK**

The work completed on the CAPS SAAWC prototype leaves open the possibility of future work on several levels. The basic upper level SAAWC decomposition could be used with another SAAWC functional area, for example the Air Defense Mission Display, replacing the Air Defense Situation Display operator. The upper level decomposition could be used with some completely unrelated functional operator, such as the Intelligence

Analysis Display in the Tactical Air Command Center, replacing the ADSD operator. Additional composite operators might be identified to provide common services either partially provided for or omitted in the current upper level decomposition. Such operators might include a directory service, a resource scheduler service, or a network management service. Composite operators currently identified in the upper level diagram might be decomposed differently to identify additional functionality or to provide a greater level of detail in the currently identified functionality. For example, the `update_filter` operator in the Track Server composite operator might be decomposed to convey functionality which determines whether incoming filter requests are redundant or improperly initialized. Timing constraints and control constraints could be used within designated operators to construct a prototype which more accurately behaves like the real-world system it is simulating. Such behavior could be examined to identify the nodes and datalinks which present potential system bottlenecks, or which require exceptional processing and secondary storage resources. Finally, some or all user-defined data types and atomic operators could be implemented with commercially available components or by improving the existing Ada source code to more closely resemble the behavior of the simulated system.



## **APPENDIX A**

### **SAAWC PROTOTYPE SOURCE CODE**

```

TYPE ADMINISTER
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : ADMINISTER
END
IMPLEMENTATION ADA ADMINISTER
END

TYPE ALERT
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : ALERT
END
IMPLEMENTATION ADA ALERT
END

TYPE BITS
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : BITS
END
IMPLEMENTATION ADA BITS
END

TYPE CERTIFICATE
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : CERTIFICATE
END
IMPLEMENTATION ADA CERTIFICATE
END

TYPE DB_RECORD
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : DB_RECORD
END
IMPLEMENTATION ADA DB_RECORD
END

TYPE DEVICE
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : DEVICE
END

END
IMPLEMENTATION ADA DEVICE
END

TYPE KEY
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : KEY
END
IMPLEMENTATION ADA KEY
END

TYPE MAP
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : MAP
END
IMPLEMENTATION ADA MAP
END

TYPE MESSAGE
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : MESSAGE
END
IMPLEMENTATION ADA MESSAGE
END

TYPE PARAM
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : PARAM
END
IMPLEMENTATION ADA PARAM
END

TYPE PATH
SPECIFICATION
  OPERATOR EMPTY
  SPECIFICATION
  OUTPUT
END
  dummy : PATH
END
IMPLEMENTATION ADA PATH
END

TYPE SIGNATURE

```

```

SPECIFICATION
OPERATOR EMPTY
SPECIFICATION
OUTPUT
dummy : SIGNATURE
END
IMPLEMENTATION ADA SIGNATURE
END
TYPE TIMESTAMP
SPECIFICATION
OPERATOR EMPTY
SPECIFICATION
OUTPUT
dummy : TIMESTAMP
END
IMPLEMENTATION ADA TIMESTAMP
END
TYPE TRACKS
SPECIFICATION
OPERATOR EMPTY
SPECIFICATION
OUTPUT
dummy : TRACKS
END
IMPLEMENTATION ADA TRACKS
END
OPERATOR AD_sit_interface
SPECIFICATION
INPUT
ad_del_alerts : ALERT,
ad_del_data : DB_RECORD,
ad_del_map : MAP,
ad_del_msgs : MESSAGE,
ad_del_tracks : TRACKS,
data_out : MESSAGE,
filter_alerts : ALERT,
filter_data : DB_RECORD,
filter_maps : MAP,
filter_msgs : MESSAGE,
filter_tracks : TRACKS,
iss_certificate : CERTIFICATE,
iss_key : KEY,
iss_signature : SIGNATURE,
print_file : MESSAGE,
print_response : MESSAGE,
req_secure_session : MESSAGE
OUTPUT
ad_sub_alerts : ALERT,
ad_sub_data : DB_RECORD,
ad_sub_map : MAP,
ad_sub_msgs : MESSAGE,
ad_sub_tracks : TRACKS,
print_req : MESSAGE,
req_certificate : CERTIFICATE,
req_key : KEY,
req_signature : SIGNATURE,
req_secure_session : MESSAGE

```

# IMPLEMENTATION

## GRAPH

VERTEX alerts\_display\_db

VERTEX data\_display\_db

VERTEX map\_display\_db

VERTEX msg\_display\_db

VERTEX msg\_out\_manager

VERTEX print\_manager

VERTEX security\_manager

VERTEX track\_display\_db

EDGE ad\_del\_alerts

EXTERNAL -> alerts\_display\_db

EDGE ad\_del\_data

EXTERNAL -> data\_display\_db

EDGE ad\_del\_map

EXTERNAL -> map\_display\_db

EDGE ad\_del\_msgs

EXTERNAL -> msg\_display\_db

EDGE ad\_del\_tracks

EXTERNAL -> track\_display\_db

EDGE ad\_sub\_alerts

EXTERNAL -> alerts\_display\_db

EDGE ad\_sub\_data

EXTERNAL -> data\_display\_db

EDGE ad\_sub\_map

EXTERNAL -> map\_display\_db

EDGE ad\_sub\_msgs

EXTERNAL -> msg\_display\_db

EDGE ad\_sub\_tracks

EXTERNAL -> track\_display\_db

EDGE data\_out

EXTERNAL -> msg\_out\_manager

EDGE filter\_alerts

EXTERNAL -> alerts\_display\_db





```

VERTEX resolve_alerts
VERTEX update_msgs

EDGE alerts_filter
alerts_update_filter ->
resolve_alerts

EDGE alerts_filter
alerts_update_filter ->
alerts_update_filter

EDGE alerts_message_db
update_msgs ->
update_msgs

EDGE alerts_message_db
update_msgs ->
resolve_alerts

EDGE feed_msgs
EXTERNAL ->
update_msgs

EDGE req_alerts
EXTERNAL ->
alerts_update_filter

EDGE respond_alerts
resolve_alerts ->
EXTERNAL

CONTROL CONSTRAINTS
OPERATOR alerts_update_filter

OPERATOR resolve_alerts

OPERATOR update_msgs

END

OPERATOR Comms_server
SPECIFICATION
INPUT
bits_in : BITS,
session_control : MESSAGE,
session_data : MESSAGE
OUTPUT
FTP_msg_in : MESSAGE,
HTTP_msg_in : MESSAGE,
SMTP_msg_in : MESSAGE,
SNMP_msg_in : MESSAGE,
UDP_msg_in : MESSAGE,
bits_out : BITS

END
IMPLEMENTATION
GRAPH
VERTEX FTP_processor_in
VERTEX FTP_processor_out
VERTEX HTTP_processor_in
VERTEX HTTP_processor_out
VERTEX SMTP_processor_in
VERTEX SMTP_processor_out
VERTEX SNMP_processor_in
VERTEX SNMP_processor_out

VERTEX session_manager
session_manager_in
session_manager_out
session_manager_interface_out

EDGE HTTP_in
session_manager ->
HTTP_processor_in
EXTERNAL

EDGE HTTP_msg_in
HTTP_processor_in ->
EXTERNAL

EDGE HTTP_msg_out
session_manager ->
HTTP_processor_out
EXTERNAL

EDGE HTTP_out
HTTP_processor_out ->
network_interface_out

EDGE SMTP_in
session_manager ->
SMTP_processor_in

EDGE SMTP_msg_in
SMTP_processor_in ->
EXTERNAL

EDGE SMTP_msg_out
session_manager ->
SMTP_processor_out

EDGE SMTP_out
SMTP_processor_out ->
network_interface_out

EDGE SNMP_in
session_manager ->
SNMP_processor_in

```

```

SNMP_processor_in ->
EXTERNAL

EDGE SNMP_msg_out
session_manager ->
SNMP_processor_out

EDGE SNMP_out
SNMP_processor_out ->
network_interface_out

EDGE UDP_in
session_manager ->
UDP_processor_in
EXTERNAL

EDGE UDP_msg_in
UDP_processor_in ->
UDP_processor_out

EDGE UDP_out
UDP_processor_out ->
network_interface_out

EDGE bits_in
EXTERNAL ->
network_interface_in

EDGE bits_out
network_interface_out ->
EXTERNAL

EDGE data_str_in
network_interface_in ->
session_manager

EDGE session_control
session_manager ->
session_manager

EDGE session_control
EXTERNAL ->
session_manager

EDGE session_data
EXTERNAL ->
session_manager

DATA STREAM
FTP_in : MESSAGE,
FTP_msg_out : MESSAGE,
FTP_out : MESSAGE,
HTTP_in : MESSAGE,
HTTP_msg_out : MESSAGE,
HTTP_out : MESSAGE,
SMTP_in : MESSAGE,
SMTP_msg_out : MESSAGE,
SMTP_out : MESSAGE,
SNMP_in : MESSAGE,
SNMP_msg_out : MESSAGE,
SNMP_out : MESSAGE,
UDP_in : MESSAGE,
UDP_msg_out : MESSAGE,
UDP_out : MESSAGE,
data_str_in : MESSAGE

CONTROL CONSTRAINTS
OPERATOR FTP_processor_in
OPERATOR FTP_processor_out
OPERATOR HTTP_processor_in
OPERATOR HTTP_processor_out
OPERATOR SMTP_processor_in
OPERATOR SMTP_processor_out
OPERATOR SNMP_processor_in
OPERATOR SNMP_processor_out
OPERATOR UDP_processor_in
OPERATOR UDP_processor_out
OPERATOR network_interface_in
OPERATOR network_interface_out
OPERATOR session_manager
END

OPERATOR Correlat_server
SPECIFICATION
INPUT
cs_del_tracks : TRACKS,
request_tracks : TRACKS,
respond_db_change : DB_RECORD
OUTPUT
respond_valid_tracks : TRACKS,
subscribe_db_changes : DB_RECORD,
subscribe_tracks : TRACKS
STATES
correl_filter : TRACKS
INITIALLY
EMPTY
STATES
correl_record_db : DB_RECORD
INITIALLY
EMPTY
STATES
correl_track_db : TRACKS
INITIALLY
EMPTY
IMPLEMENTATION
GRAPH
VERTEX correl_handle_query
VERTEX correl_update_filter
VERTEX correl_update_tracks
VERTEX correlate_tracks
VERTEX update_tactical_db
EDGE correl_filter
correl_update_filter ->
correl_update_filter

```

```
EDGE correl_filter
correl_update_filter ->
correl_handle_query
```

```
EDGE correl_record_db
update_tactical_db ->
update_tactical_db
```

```
EDGE correl_record_db
update_tactical_db ->
correlate_tracks
```

```
EDGE correl_track_db
correl_update_tracks ->
correl_update_tracks
```

```
EDGE correl_track_db
correl_update_tracks ->
correlate_tracks
```

```
EDGE cs_del_tracks
EXTERNAL ->
correl_update_tracks
```

```
EDGE request_tracks
EXTERNAL ->
correl_update_filter
```

```
EDGE respond_db_change
EXTERNAL ->
update_tactical_db
```

```
EDGE respond_valid_tracks
correl_handle_query ->
EXTERNAL
```

```
EDGE subscribe_db_changes
correl_update_filter ->
EXTERNAL
```

```
EDGE subscribe_tracks
correl_update_filter ->
EXTERNAL
```

```
EDGE valid_tracks
correlate_tracks ->
correl_handle_query
```

```
DATA STREAM
valid_tracks : TRACKS
CONTROL CONSTRAINTS
OPERATOR correl_handle_query
```

```
OPERATOR correl_update_filter
OPERATOR correl_update_tracks
```

```
OPERATOR correlate_tracks
```

```
END
OPERATOR update_tactical_db
```

```
OPERATOR Data_manage_server
SPECIFICATION
```

```
INPUT
```

```
req_data : DB_RECORD
```

```
OUTPUT
```

```
STATES
obj_add_db : DB_RECORD
INITIALLY
EMPTY
```

```
STATES
obj_mod_db : DB_RECORD
INITIALLY
EMPTY
```

```
STATES
obj_del_db : DB_RECORD
INITIALLY
EMPTY
```

```
STATES
rec_add_db : DB_RECORD
INITIALLY
EMPTY
```

```
STATES
rec_mod_db : DB_RECORD
INITIALLY
EMPTY
```

```
STATES
rec_del_db : DB_RECORD
INITIALLY
EMPTY
```

```
STATES
file_add_db : DB_RECORD
INITIALLY
EMPTY
```

```
STATES
file_mod_db : DB_RECORD
INITIALLY
EMPTY
```

```
STATES
file_del_db : DB_RECORD
INITIALLY
EMPTY
```

```
END
IMPLEMENTATION
GRAPH
```

```
VERTEX add_file
VERTEX add_object
```

```
VERTEX add_record
VERTEX delete_file
```

```
VERTEX delete_object
VERTEX delete_record
```

```
VERTEX formal_response
VERTEX mod_file
```

```
VERTEX mod_object
VERTEX mod_record
```

```
VERTEX resolve_data_type
VERTEX resolve_request_type
```

```
VERTEX retrieve_file
VERTEX retrieve_object
```

```

VERTEX retrieve_record ->
EDGE file_add_db
add_file ->
format_response

EDGE file_add_db
add_file ->
add_file

EDGE file_del_db
delete_file ->
format_response

EDGE file_del_db
delete_file ->
delete_file

EDGE file_mod_db
mod_file ->
format_response

EDGE file_mod_db
mod_file ->
mod_file

EDGE file_retr_msg
retrieve_file ->
format_response

EDGE obj_add_db
add_object ->
add_object

EDGE obj_add_db
add_object ->
add_object

EDGE obj_del_db
delete_object ->
format_response

EDGE obj_del_db
delete_object ->
delete_object

EDGE obj_mod_db
mod_object ->
mod_object

EDGE obj_mod_db
mod_object ->
mod_object

EDGE obj_mod_db
mod_object ->
mod_object

EDGE obj_retr_msg
retrieve_object ->
format_response

EDGE rec_add_db
add_record ->
format_response

EDGE rec_add_db
add_record ->
add_record

EDGE rec_del_db
delete_record ->
format_response

EDGE rec_del_db
delete_record ->
delete_record

EDGE rec_mod_db
mod_record ->
format_response

EDGE rec_mod_db
mod_record ->
mod_record

EDGE rec_retr_msg
retrieve_record ->
format_response

EDGE rec_retr_msg
retrieve_record ->
add_file

EDGE req_add_obj
resolve_request_type ->
add_object

EDGE req_add_rec
resolve_request_type ->
add_record

EDGE req_data
EXTERNAL ->
resolve_data_type

EDGE req_data_type
resolve_data_type ->
resolve_request_type

EDGE req_del_file
resolve_request_type ->
delete_file

EDGE req_del_obj
resolve_request_type ->
delete_object

EDGE req_del_rec
resolve_request_type ->
delete_record

EDGE req_mod_file
resolve_request_type ->
mod_file

EDGE req_mod_obj
resolve_request_type ->
mod_object

EDGE req_mod_rec
resolve_request_type ->
mod_record

EDGE req_retr_file
resolve_request_type ->
retrieve_file

```

```
EDGE req_retr_obj
  resolve_request_type ->
  retrieve_object
```

```
EDGE req_retr_rec
  resolve_request_type ->
  retrieve_record
```

```
EDGE respond_msg
  format_response ->
  EXTERNAL
```

```
DATA STREAM
file_retr_msg : DB_RECORD,
obj_retr_msg : DB_RECORD,
rec_retr_msg : DB_RECORD,
req_add_file : DB_RECORD,
req_add_obj : DB_RECORD,
req_add_rec : DB_RECORD,
req_data_type : DB_RECORD,
req_del_file : DB_RECORD,
req_del_obj : DB_RECORD,
req_del_rec : DB_RECORD,
req_mod_file : DB_RECORD,
req_mod_obj : DB_RECORD,
req_mod_rec : DB_RECORD,
req_retr_file : DB_RECORD,
req_retr_obj : DB_RECORD,
req_retr_rec : DB_RECORD,
CONTROL CONSTRAINTS
OPERATOR add_file
```

```
OPERATOR add_object
```

```
OPERATOR add_record
```

```
OPERATOR delete_file
```

```
OPERATOR delete_object
```

```
OPERATOR delete_record
```

```
OPERATOR format_response
```

```
OPERATOR mod_file
```

```
OPERATOR mod_object
```

```
OPERATOR mod_record
```

```
OPERATOR resolve_data_type
```

```
OPERATOR resolve_request_type
```

```
OPERATOR retrieve_file
```

```
OPERATOR retrieve_object
```

```
OPERATOR retrieve_record
```

```
END
```

```
OPERATOR Device_server
  SPECIFICATION
```

```
INPUT
```

```
administer_device : DEVICE
```

```
OUTPUT
```

```
device_status : BOOLEAN
```

```
IMPLEMENTATION
GRAPH
  VERTEX mount_device
```

```
EDGE administer_device
  EXTERNAL ->
  mount_device
```

```
EDGE device_status
  mount_device ->
  mount_device
```

```
EDGE device_status
  mount_device ->
  EXTERNAL
  CONTROL CONSTRAINTS
  OPERATOR mount_device
```

```
END
```

```
OPERATOR FTP_processor_in
  SPECIFICATION
```

```
INPUT
```

```
FTP_in : MESSAGE
```

```
OUTPUT
```

```
FTP_msg_in : MESSAGE
```

```
END
```

```
IMPLEMENTATION ADA FTP_processor_in
```

```
END
```

```
OPERATOR FTP_processor_out
  SPECIFICATION
```

```
INPUT
```

```
FTP_msg_out : MESSAGE
```

```
OUTPUT
```

```
FTP_out : MESSAGE
```

```
END
```

```
IMPLEMENTATION ADA FTP_processor_out
```

```
END
```

```
OPERATOR HTTP_processor_in
  SPECIFICATION
```

```
INPUT
```

```
HTTP_in : MESSAGE
```

```
OUTPUT
```

```
HTTP_msg_in : MESSAGE
```

```
END
```

```
IMPLEMENTATION ADA HTTP_processor_in
```

```
END
```

```
OPERATOR HTTP_processor_out
  SPECIFICATION
```

```
INPUT
```

```
HTTP_msg_out : MESSAGE
```

```
OUTPUT
```

```
HTTP_out : MESSAGE
```

```
END
```

```
IMPLEMENTATION ADA HTTP_processor_out
```

```
END
```

```
OPERATOR Map_server
  SPECIFICATION
```

```
INPUT
```

```

OUTPUT
deliver_map : MAP
END
IMPLEMENTATION
GRAPH
VERTEX locate_map

EDGE deliver_map
locate_map ->
EXTERNAL

EDGE request_map
EXTERNAL ->
locate_map
CONTROL CONSTRAINTS
OPERATOR locate_map
END

OPERATOR msg_server
SPECIFICATION
INPUT
feed_msgs : MESSAGE,
req_template : MESSAGE,
request_msgs : MESSAGE
OUTPUT
respond_msgs : MESSAGE,
respond_template : MESSAGE
STATES
msg_filter : MESSAGE
INITIALLY
EMPTY
STATES
msg_message_db : MESSAGE
INITIALLY
EMPTY
IMPLEMENTATION
GRAPH
VERTEX archive_msgs

VERTEX msg_handle_query
VERTEX msg_update_filter
VERTEX template_database
EDGE feed_msgs
EXTERNAL ->
archive_msgs
EDGE msg_filter
msg_update_filter ->
msg_handle_query
EDGE msg_update_filter
msg_update_filter ->
msg_handle_query
EDGE msg_message_db
archive_msgs ->
archive_msgs
EDGE req_template

EXTERNAL ->
template_database
EDGE request_msgs
EXTERNAL ->
msg_update_filter
EDGE respond_msgs
msg_handle_query ->
EXTERNAL
EDGE respond_template
template_database ->
EXTERNAL
CONTROL CONSTRAINTS
OPERATOR archive_msgs
OPERATOR msg_handle_query
OPERATOR msg_update_filter
OPERATOR template_database
END

OPERATOR Name_server
SPECIFICATION
INPUT
mod_obj_loc : ADMINISTER,
req_resource : MESSAGE
OUTPUT
resource_phys_loc : MESSAGE
END
IMPLEMENTATION
GRAPH
VERTEX resolve_resource_loc

EDGE mod_obj_loc
resolve_resource_loc ->
resolve_resource_loc
EDGE mod_obj_loc
EXTERNAL ->
resolve_resource_loc
EDGE req_resource
EXTERNAL ->
resolve_resource_loc
EDGE resource_phys_loc
resource_phys_loc ->
resolve_resource_loc
END

OPERATOR Print_server
SPECIFICATION
INPUT
print_reqmsg : MESSAGE,
receive_file : MESSAGE
OUTPUT
job_spooledmsg : MESSAGE,
request_file : MESSAGE
END
IMPLEMENTATION
GRAPH
VERTEX build_file

```

```

VERTEX check_for_file
VERTEX spool_file

EDGE file
check_for_file ->
  spool_file

EDGE file_name
build_file ->
  spool_file

EDGE job_spooled_msg
  spool_file ->
  EXTERNAL

EDGE print_request
  EXTERNAL ->
  check_for_file

EDGE receive_file
  EXTERNAL ->
  check_for_file

EDGE request_file
  check_for_file ->
  EXTERNAL

EDGE screen_param
  check_for_file ->
  build_file

DATA STREAM
  file : PATH,
  file_name : PATH,
  screen_param : PARAM
CONTROL CONSTRAINTS
  OPERATOR build_file

  OPERATOR check_for_file

  OPERATOR spool_file

END

OPERATOR SAAMC
SPECIFICATION
  STATES
    device_status : BOOLEAN
    INITIALITY
      FALSE
  STATES
    filter_alerts : ALERT
    INITIALITY
      EMPTY
  STATES
    filter_data : DB_RECORD
    INITIALITY
      EMPTY
  STATES
    filter_maps : MAP
    INITIALITY
      EMPTY
  STATES
    filter_msgs : MESSAGE
    INITIALITY
      EMPTY

filter_tracks : TRACKS
  INITIALITY
    EMPTY
  STATES
    iss_certificate : CERTIFICATE
    INITIALITY
      EMPTY
  STATES
    iss_key : KEY
    INITIALITY
      EMPTY
  STATES
    iss_signature : SIGNATURE
    INITIALITY
      EMPTY
  STATES
    issue_certificate : CERTIFICATE
    INITIALITY
      EMPTY
  STATES
    issue_key : KEY
    INITIALITY
      EMPTY
  STATES
    issue_signature : SIGNATURE
    INITIALITY
      EMPTY
  STATES
    mod_obj_loc : ADMINISTER
    INITIALITY
      EMPTY
  STATES
    mod_obj_loc : ADMINISTER
    INITIALITY
      EMPTY
  STATES
    mod_rules : ADMINISTER
    INITIALITY
      EMPTY
  STATES
    session_control : MESSAGE
    INITIALITY
      EMPTY
  STATES
    session_data : MESSAGE
    INITIALITY
      EMPTY
  STATES
    ad_del_alerts : ALERT
    INITIALITY
      EMPTY
  STATES
    ad_del_data : DB_RECORD
    INITIALITY
      EMPTY
  STATES
    ad_del_map : MAP
    INITIALITY
      EMPTY
  STATES
    ad_del_msgs : MESSAGE
    INITIALITY
      EMPTY
  STATES
    ad_del_tracks : TRACKS
    INITIALITY
      EMPTY
  STATES
    print_response : MESSAGE
    INITIALITY
      EMPTY

```



```

STATES
  bits_out : BITS
  INITIALLY
    EMPTY
STATES
  deliver_map : MAP
  INITIALLY
    EMPTY
STATES
  respond_valid_tracks : TRACKS
  INITIALLY
    EMPTY
STATES
  subscribe_tracks : TRACKS
  INITIALLY
    EMPTY
STATES
  subscribe_db_changes : DB_RECORD
  INITIALLY
    EMPTY
STATES
  respond_alerts : ALERT
  INITIALLY
    EMPTY
STATES
  respond_tracks : TRACKS
  INITIALLY
    EMPTY
STATES
  respond_msgs : MESSAGE
  INITIALLY
    EMPTY
STATES
  respond_template : MESSAGE
  INITIALLY
    EMPTY
STATES
  resource_phys_loc : MESSAGE
  INITIALLY
    EMPTY
STATES
  respond_msg : MESSAGE
  INITIALLY
    EMPTY
STATES
  job_spooled_msg : MESSAGE
  INITIALLY
    EMPTY
STATES
  request_file : MESSAGE
  INITIALLY
    EMPTY
  EMPTY
END
IMPLEMENTATION
GRAPH
  VERTEX AD_Sit_interface
  VERTEX Alerts_server
  VERTEX Comms_server
  VERTEX Correlat_server
  VERTEX Data_manage_server
  VERTEX Device_server
  VERTEX Map_server
  VERTEX Msg_server
  VERTEX Name_server
  VERTEX Print_server
  VERTEX Security_server
  VERTEX TADIL_J : 100 MS
  VERTEX Time_server
  VERTEX Track_server : 500 MS
  VERTEX broker
  VERTEX get_user_cmd
  VERTEX network
  EDGE FTP_msg_in
    Comms_server ->
    broker
  EDGE HTTP_msg_in
    Comms_server ->
    broker
  EDGE SMTP_msg_in
    Comms_server ->
    broker
  EDGE SNMP_msg_in
    Comms_server ->
    broker
  EDGE UDP_msg_in
    Comms_server ->
    broker
  EDGE ad_del_alerts
    broker ->
    AD_Sit_interface
  EDGE ad_del_data
    broker ->
    AD_Sit_interface
  EDGE ad_del_map
    broker ->
    AD_Sit_interface
  EDGE ad_del_msgs
    broker ->
    AD_Sit_interface
  EDGE ad_del_tracks
    broker ->
    AD_Sit_interface
  EDGE ad_sub_alerts
    AD_Sit_interface ->
    broker
  EDGE ad_sub_data

```

```
AD_Sit_interface ->
broker

EDGE ad_sub_map
AD_Sit_interface ->
broker

EDGE ad_sub_msgs
AD_Sit_interface ->
broker

EDGE ad_sub_tracks
AD_Sit_interface ->
broker

EDGE adminster_device
broker ->
Device_server

EDGE bits_in
network ->
Comms_server

EDGE bits_out
Comms_server ->
network

EDGE cs_del_tracks
broker ->
Correat_server

EDGE data_out
get_user_cmd ->
AD_Sit_interface

EDGE deliver_map
Map_server ->
broker

EDGE device_status
Device_server ->
broker

EDGE feed_msgs
broker ->
Alerts_server

EDGE feed_msgs
broker ->
Msg_server

EDGE feed_tracks
TADIL_J ->
Track_server

EDGE filter_alerts
get_user_cmd ->
AD_Sit_interface

EDGE filter_data
get_user_cmd ->
AD_Sit_interface

EDGE filter_maps
get_user_cmd ->
AD_Sit_interface

AD_Sit_interface

EDGE filter_msgs
get_user_cmd ->
AD_Sit_interface

EDGE filter_tracks
get_user_cmd ->
AD_Sit_interface

EDGE iss_certificate
broker ->
AD_Sit_interface

EDGE iss_key
broker ->
AD_Sit_interface

EDGE iss_signature
broker ->
AD_Sit_interface

EDGE iss_certificate
Security_server ->
broker

EDGE issue_key
Security_server ->
broker

EDGE issue_signature
Security_server ->
broker

EDGE job_spooled_msg
print_server ->
broker

EDGE mod_obj_loc
get_user_cmd ->
Name_server

EDGE mod_rules
get_user_cmd ->
broker

EDGE new_time
Time_server ->
broker

EDGE print_file
get_user_cmd ->
AD_Sit_interface

EDGE print_req
AD_Sit_interface ->
broker

EDGE print_request
broker ->
print_server

EDGE print_response
broker ->
AD_Sit_interface

EDGE receive_file
broker ->
```

```

EDGE req_alerts
broker ->
Alerts_server

EDGE req_certificate
AD_Sit_interface ->
broker

EDGE req_data
broker ->
Data_manage_server

EDGE req_key
AD_Sit_interface ->
broker

EDGE req_resource
broker ->
Name_server

EDGE req_secure_session
get_user_cmd ->
AD_Sit_interface

EDGE req_signature
AD_Sit_interface ->
broker

EDGE req_template
broker ->
Msg_server

EDGE req_tracks
broker ->
Track_server

EDGE request_certificate
broker ->
Security_server

EDGE request_file
print_server ->
broker

EDGE request_key
broker ->
Security_server

EDGE request_map
broker ->
Map_server

EDGE request_msgs
broker ->
Msg_server

EDGE request_signature
broker ->
Security_server

EDGE request_tracks
broker ->
Correlat_server

EDGE resource_phys_loc
Name_server ->

broker

EDGE respond_alerts
Alerts_server ->
broker

EDGE respond_db_change
broker ->
Correlat_server

EDGE respond_msg
Data_manage_server ->
broker

EDGE respond_msgs
Msg_server ->
broker

EDGE respond_template
Msg_server ->
broker

EDGE respond_tracks
Track_server ->
broker

EDGE respond_valid_tracks
Correlat_server ->
broker

EDGE secure_msg_out
AD_Sit_interface ->
broker

EDGE session_control
broker ->
Comms_server

EDGE session_data
broker ->
Comms_server

EDGE subscribe_db_changes
Correlat_server ->
broker

EDGE subscribe_tracks
Correlat_server ->
broker

DATA STREAM
FTP_msg_in : MESSAGE,
HTTP_msg_in : MESSAGE,
SMTP_msg_in : MESSAGE,
SNMP_msg_in : MESSAGE,
UDP_msg_in : MESSAGE,
ad_sub_alerts : ALERT,
ad_sub_data : DB_RECORD,
ad_sub_map : MAP,
ad_sub_msgs : MESSAGE,
ad_sub_tracks : TRACKS,
administer_device : DEVICE,
bits_in : BITS,
cs_del_tracks : TRACKS,
data_out : MESSAGE,
feed_msgs : MESSAGE,
feed_tracks : TRACKS,
new_time : TIMESTAMP,

```

```
print_file : MESSAGE,
print_req : MESSAGE,
print_request : MESSAGE,
receive_file : MESSAGE,
req_alerts : ALERT,
req_certificate : CERTIFICATE,
req_data : DB_RECORD,
req_key : KEY,
req_resource : MESSAGE,
req_secure_session : MESSAGE,
req_signature : SIGNATURE,
req_template : MESSAGE,
req_tracks : TRACKS,
req_certificate : CERTIFICATE,
request_key : KEY,
request_map : MAP,
request_msgs : MESSAGE,
request_signature : SIGNATURE,
request_tracks : TRACKS,
respond_db_change : DB_RECORD,
secure_msg_out : MESSAGE
CONTROL CONSTRAINTS
OPERATOR AD_sit_interface
```

```
OPERATOR Alerts_server
OPERATOR Comms_server
OPERATOR Correlat_server
OPERATOR Data_manage_server
OPERATOR Device_server
OPERATOR Map_server
OPERATOR Msg_server
OPERATOR Name_server
OPERATOR Print_server
OPERATOR Security_server
OPERATOR TADIL_J
PERIOD 1000 MS
OPERATOR Time_server
OPERATOR Track_server
OPERATOR broker
OPERATOR get_user_cmd
OPERATOR network
END
```

```
OPERATOR SMTP_processor_in
SPECIFICATION
```

```
INPUT
SMTP_in : MESSAGE
OUTPUT
SMTP_msg_in : MESSAGE
```

END

IMPLEMENTATION ADA\_SMTD\_processor\_in

END

```
OPERATOR SMTP_processor_out
SPECIFICATION
```

```
INPUT
SMTP_msg_out : MESSAGE
OUTPUT
SMTP_out : MESSAGE
```

```
END
IMPLEMENTATION ADA SMTP_processor_out
```

END

```
OPERATOR SNMP_processor_in
SPECIFICATION
```

```
INPUT
SNMP_in : MESSAGE
OUTPUT
SNMP_msg_in : MESSAGE
```

```
END
IMPLEMENTATION ADA SNMP_processor_in
```

END

```
OPERATOR SNMP_processor_out
SPECIFICATION
```

```
INPUT
SNMP_msg_out : MESSAGE
OUTPUT
SNMP_out : MESSAGE
```

```
END
IMPLEMENTATION ADA SNMP_processor_out
```

END

```
OPERATOR Security_server
SPECIFICATION
```

```
INPUT
request_certificate : CERTIFICATE,
request_key : KEY,
request_signature : SIGNATURE
OUTPUT
issue_certificate : CERTIFICATE,
issue_key : KEY,
issue_signature : SIGNATURE
```

```
END
IMPLEMENTATION
```

GRAPH

VERTEX validate\_certificate

VERTEX validate\_key

VERTEX validate\_signature

```
EDGE issue_certificate
validate_certificate ->
EXTERNAL
```

```
EDGE issue_certificate
validate_certificate ->
validate_certificate
```

```
EDGE issue_key
validate_key ->
EXTERNAL
```

```

validate_key ->
validate_key

EDGE issue_signature
validate_signature ->
EXTERNAL

EDGE issue_signature
validate_signature ->
validate_signature

EDGE request_certificate
EXTERNAL ->
validate_certificate

EDGE request_key
EXTERNAL ->
validate_key

EDGE request_signature
EXTERNAL ->
validate_signature
CONTROL CONSTRAINTS
OPERATOR validate_certificate

OPERATOR validate_key

END
OPERATOR validate_signature

END

OPERATOR TADL.J
SPECIFICATION
OUTPUT
    feed_tracks : TRACKS
    MAXIMUM EXECUTION TIME 100 MS
END
IMPLEMENTATION ADA TADL.J

END

OPERATOR Time_server
SPECIFICATION
OUTPUT
    new_time : TIMESTAMP
IMPLEMENTATION
    GRAPH
    VERTEX update_time

EDGE new_time
update_time ->
EXTERNAL
CONTROL CONSTRAINTS
OPERATOR update_time

END

OPERATOR Track_server
SPECIFICATION
INPUT
    feed_tracks : TRACKS,
    req_tracks : TRACKS
OUTPUT
    respond_tracks : TRACKS
STATES
    track_db : TRACKS
INITIALLY
    EMPTY

END

STATES
    filter : TRACKS
INITIALLY
    EMPTY
    MAXIMUM EXECUTION TIME 500 MS
END
IMPLEMENTATION
    GRAPH
    VERTEX handle_query
    VERTEX update_filter
    VERTEX update_tracks
    EDGE feed_tracks
    EXTERNAL ->
    update_tracks
    EDGE filter
    update_filter ->
    update_filter
    EDGE req_tracks
    EXTERNAL ->
    update_filter
    EDGE respond_tracks
    handle_query ->
    EXTERNAL
    EDGE track_db
    update_tracks ->
    handle_query
    EDGE track_db
    update_tracks ->
    update_tracks
    CONTROL CONSTRAINTS
    OPERATOR handle_query
    OPERATOR update_filter
    OPERATOR update_tracks

END

OPERATOR UDP_processor_in
SPECIFICATION
INPUT
    UDP_in : MESSAGE
OUTPUT
    UDP_msg_in : MESSAGE
END
IMPLEMENTATION ADA UDP_processor_in

END

OPERATOR UDP_processor_out
SPECIFICATION
INPUT
    UDP_msg_out : MESSAGE
OUTPUT
    UDP_out : MESSAGE
END

```

IMPLEMENTATION ADA udp\_processor\_out

END

OPERATOR add\_file

SPECIFICATION

INPUT

file\_add\_db : DB\_RECORD,

req\_add\_file : DB\_RECORD

OUTPUT

file\_add\_db : DB\_RECORD

END

IMPLEMENTATION ADA add\_file

END

OPERATOR add\_object

SPECIFICATION

INPUT

obj\_add\_db : DB\_RECORD,

req\_add\_obj : DB\_RECORD

OUTPUT

obj\_add\_db : DB\_RECORD

END

IMPLEMENTATION ADA add\_object

END

OPERATOR add\_record

SPECIFICATION

INPUT

rec\_add\_db : DB\_RECORD,

req\_add\_rec : DB\_RECORD

OUTPUT

rec\_add\_db : DB\_RECORD

END

IMPLEMENTATION ADA add\_record

END

OPERATOR alerts\_display\_db

SPECIFICATION

INPUT

ad\_del\_alerts : ALERT,

filter\_alerts : ALERT

OUTPUT

ad\_sub\_alerts : ALERT,

filter\_alerts : ALERT

END

IMPLEMENTATION ADA alerts\_display\_db

END

OPERATOR alerts\_update\_filter

SPECIFICATION

INPUT

alerts\_filter : TRACKS,

req\_alerts : ALERT

OUTPUT

alerts\_filter : TRACKS

END

IMPLEMENTATION ADA alerts\_update\_filter

END

OPERATOR archive\_msgs

INPUT

feed\_msgs : MESSAGE,

msg\_message\_db : MESSAGE

OUTPUT

msg\_message\_db : MESSAGE

END

IMPLEMENTATION ADA archive\_msgs

END

OPERATOR broker

SPECIFICATION

INPUT

ftp\_msg\_in : MESSAGE,

http\_msg\_in : MESSAGE,

smtp\_msg\_in : MESSAGE,

snmp\_msg\_in : MESSAGE,

udp\_msg\_in : MESSAGE,

ad\_sub\_alerts : ALERT,

ad\_sub\_data : DB\_RECORD,

ad\_sub\_map : MAP,

ad\_sub\_msgs : MESSAGE,

ad\_sub\_tracks : TRACKS,

deliver\_map : MAP,

device\_status : BOOLEAN,

issue\_certificate : CERTIFICATE,

issue\_key : KEY,

issue\_signature : SIGNATURE,

job\_spooled\_msg : MESSAGE,

mod\_rules : ADMINISTER,

new\_time : TIMESTAMP,

print\_req : MESSAGE,

req\_certificate : CERTIFICATE,

req\_key : KEY,

req\_signature : SIGNATURE,

request\_file : MESSAGE,

resource\_phys\_loc : MESSAGE,

respond\_alerts : ALERT,

respond\_msg : MESSAGE,

respond\_msgs : MESSAGE,

respond\_template : MESSAGE,

respond\_tracks : TRACKS,

respond\_valid\_tracks : TRACKS,

secure\_msg\_out : MESSAGE,

subscribe\_db\_changes : DB\_RECORD,

subscribe\_tracks : TRACKS

OUTPUT

ad\_del\_alerts : ALERT,

ad\_del\_data : DB\_RECORD,

ad\_del\_map : MAP,

ad\_del\_msgs : MESSAGE,

ad\_del\_tracks : TRACKS,

administer\_device : DEVICE,

cs\_del\_tracks : TRACKS,

feed\_msgs : MESSAGE,

iss\_certificate : CERTIFICATE,

iss\_key : KEY,

iss\_signature : SIGNATURE,

print\_request : MESSAGE,

print\_response : MESSAGE,

receive\_file : MESSAGE,

req\_alerts : ALERT,

req\_data : DB\_RECORD,

req\_resource : MESSAGE,

req\_template : MESSAGE,

req\_tracks : TRACKS,

```

request_key : KEY,
request_map : MAP,
request_msgs : MESSAGE,
request_signature : SIGNATURE,
request_tracks : TRACKS,
respond_db_change : DB_RECORD,
session_control : MESSAGE,
session_data : MESSAGE
STATES
  client_req : MESSAGE
  INITIALLY
  EMPTY
STATES
  srv_response : MESSAGE
  INITIALLY
  EMPTY
END
IMPLEMENTATION
GRAPH
  VERTEX business_rules_manager
  VERTEX client_thread_manager
  VERTEX server_thread_manager
  EDGE ftp_msg_in
    EXTERNAL ->
    server_thread_manager
  EDGE http_msg_in
    EXTERNAL ->
    server_thread_manager
  EDGE smtp_msg_in
    EXTERNAL ->
    server_thread_manager
  EDGE snmp_msg_in
    EXTERNAL ->
    server_thread_manager
  EDGE udp_msg_in
    EXTERNAL ->
    server_thread_manager
  EDGE ad_del_alerts
    client_thread_manager ->
    EXTERNAL
  EDGE ad_del_data
    client_thread_manager ->
    EXTERNAL
  EDGE ad_del_map
    client_thread_manager ->
    EXTERNAL
  EDGE ad_del_msgs
    client_thread_manager ->
    EXTERNAL
  EDGE ad_del_tracks
    client_thread_manager ->
    EXTERNAL
  EDGE ad_sub_alerts
    EXTERNAL ->
  client_thread_manager
  EDGE ad_sub_map
    EXTERNAL ->
    client_thread_manager
  EDGE ad_sub_msgs
    EXTERNAL ->
    client_thread_manager
  EDGE ad_sub_tracks
    EXTERNAL ->
    client_thread_manager
  EDGE administer_device
    server_thread_manager ->
    EXTERNAL
  EDGE client_req
    client_thread_manager ->
    client_thread_manager
  EDGE client_req
    client_thread_manager ->
    client_thread_manager
  EDGE client_req
    client_thread_manager ->
    client_thread_manager
  EDGE cs_del_tracks
    server_thread_manager ->
    EXTERNAL
  EDGE deliver_map
    EXTERNAL ->
    server_thread_manager
  EDGE device_status
    EXTERNAL ->
    server_thread_manager
  EDGE feed_msgs
    server_thread_manager ->
    EXTERNAL
  EDGE iss_certificate
    client_thread_manager ->
    EXTERNAL
  EDGE iss_key
    client_thread_manager ->
    EXTERNAL
  EDGE iss_signature
    client_thread_manager ->
    EXTERNAL
  EDGE issue_certificate
    EXTERNAL ->
    server_thread_manager
  EDGE issue_key
    EXTERNAL ->
    server_thread_manager
  EDGE issue_signature
    EXTERNAL ->
    server_thread_manager

```

```
EXTERNAL ->
server_thread_manager

EDGE job_spoiled_msg
EXTERNAL ->
server_thread_manager

EDGE mod_rules
business_rules_manager ->
business_rules_manager

EDGE mod_rules
EXTERNAL ->
business_rules_manager

EDGE new_time
EXTERNAL ->
server_thread_manager

EDGE print_req
EXTERNAL ->
client_thread_manager

EDGE print_request
server_thread_manager ->
EXTERNAL

EDGE print_response
client_thread_manager ->
EXTERNAL

EDGE receive_file
server_thread_manager ->
EXTERNAL

EDGE req_alerts
server_thread_manager ->
EXTERNAL

EDGE req_certificate
EXTERNAL ->
client_thread_manager

EDGE req_data
server_thread_manager ->
EXTERNAL

EDGE req_key
EXTERNAL ->
client_thread_manager

EDGE req_resource
server_thread_manager ->
EXTERNAL

EDGE req_signature
EXTERNAL ->
client_thread_manager

EDGE req_template
server_thread_manager ->
EXTERNAL

EDGE req_tracks
server_thread_manager ->
EXTERNAL

EDGE request_certificate
server_thread_manager ->
EXTERNAL

EDGE request_file
EXTERNAL ->
server_thread_manager

EDGE request_key
server_thread_manager ->
EXTERNAL

EDGE request_map
server_thread_manager ->
EXTERNAL

EDGE request_msgs
server_thread_manager ->
EXTERNAL

EDGE request_signature
server_thread_manager ->
EXTERNAL

EDGE request_tracks
server_thread_manager ->
EXTERNAL

EDGE resource_phys_loc
EXTERNAL ->
server_thread_manager

EDGE respond_alerts
EXTERNAL ->
server_thread_manager

EDGE respond_db_change
server_thread_manager ->
EXTERNAL

EDGE respond_msg
EXTERNAL ->
server_thread_manager

EDGE respond_msgs
EXTERNAL ->
server_thread_manager

EDGE respond_template
EXTERNAL ->
server_thread_manager

EDGE respond_tracks
EXTERNAL ->
server_thread_manager

EDGE respond_valid_tracks
EXTERNAL ->
server_thread_manager

EDGE secure_msg_out
EXTERNAL ->
client_thread_manager

EDGE session_control
server_thread_manager ->
EXTERNAL
```



```

EDGE session_data
server_thread_manager ->
EXTERNAL

EDGE srv_response
server_thread_manager ->
server_thread_manager

EDGE srv_response
server_thread_manager ->
business_rules_manager

EDGE subscribe_db_changes
EXTERNAL ->
server_thread_manager

EDGE subscribe_tracks
EXTERNAL ->
server_thread_manager

EDGE valid_client_req
business_rules_manager ->
server_thread_manager

EDGE valid_srv_response
business_rules_manager ->
client_thread_manager

DATA STREAM
valid_client_req : MESSAGE,
valid_srv_response : MESSAGE
CONTROL CONSTRAINTS
OPERATOR business_rules_manager

OPERATOR client_thread_manager

OPERATOR server_thread_manager
END

OPERATOR build_file
SPECIFICATION
INPUT
screen_param : PARAM
OUTPUT
file_name : PATH
END

IMPLEMENTATION ADA build_file
END

OPERATOR business_rules_manager
SPECIFICATION
INPUT
client_req : MESSAGE,
mod_rules : ADMINISTER,
srv_response : MESSAGE
OUTPUT
mod_rules : ADMINISTER,
valid_client_req : MESSAGE,
valid_srv_response : MESSAGE
END

IMPLEMENTATION ADA business_rules_manager
END

OPERATOR check_for_file
SPECIFICATION
END

INPUT
print_request : MESSAGE,
receive_file : MESSAGE
OUTPUT
file : PATH,
request_file : MESSAGE,
screen_param : PARAM
END

IMPLEMENTATION ADA check_for_file
END

OPERATOR client_thread_manager
SPECIFICATION
INPUT
ad_sub_alerts : ALERT,
ad_sub_data : DB_RECORD,
ad_sub_map : MAP,
ad_sub_msgs : MESSAGE,
ad_sub_tracks : TRACKS,
client_req : MESSAGE,
print_req : MESSAGE,
req_certificate : CERTIFICATE,
req_key : KEY,
req_signature : SIGNATURE,
secure_msg_out : MESSAGE,
valid_srv_response : MESSAGE
OUTPUT
ad_del_alerts : ALERT,
ad_del_data : DB_RECORD,
ad_del_map : MAP,
ad_del_msgs : MESSAGE,
ad_del_tracks : TRACKS,
client_req : MESSAGE,
iss_certificate : CERTIFICATE,
iss_key : KEY,
iss_signature : SIGNATURE,
print_response : MESSAGE
END

IMPLEMENTATION ADA client_thread_manager
END

OPERATOR correl_handle_query
SPECIFICATION
INPUT
correl_filter : TRACKS,
valid_tracks : TRACKS
OUTPUT
respond_valid_tracks : TRACKS
END

IMPLEMENTATION ADA correl_handle_query
END

OPERATOR correl_update_filter
SPECIFICATION
INPUT
correl_filter : TRACKS,
request_tracks : TRACKS
OUTPUT
correl_filter : TRACKS,
subscribe_db_changes : DB_RECORD,
subscribe_tracks : TRACKS
END

IMPLEMENTATION ADA correl_update_filter
END

```

```

END
OPERATOR correl_update_tracks
SPECIFICATION
  INPUT
    correl_track_db : TRACKS,
    cs_del_tracks : TRACKS
  OUTPUT
    correl_track_db : TRACKS
END
IMPLEMENTATION ADA correl_update_tracks
END

OPERATOR correlate_tracks
SPECIFICATION
  INPUT
    correl_record_db : DB_RECORD,
    correl_track_db : TRACKS
  OUTPUT
    valid_tracks : TRACKS
END
IMPLEMENTATION ADA correlate_tracks
END

OPERATOR data_display_db
SPECIFICATION
  INPUT
    ad_del_data : DB_RECORD,
    filter_data : DB_RECORD
  OUTPUT
    ad_sub_data : DB_RECORD,
    filter_data : DB_RECORD
END
IMPLEMENTATION ADA data_display_db
END

OPERATOR delete_file
SPECIFICATION
  INPUT
    file_del_db : DB_RECORD,
    req_del_file : DB_RECORD
  OUTPUT
    file_del_db : DB_RECORD
END
IMPLEMENTATION ADA delete_file
END

OPERATOR delete_object
SPECIFICATION
  INPUT
    obj_del_db : DB_RECORD,
    req_del_obj : DB_RECORD
  OUTPUT
    obj_del_db : DB_RECORD
END
IMPLEMENTATION ADA delete_object
END

OPERATOR delete_record
SPECIFICATION
  INPUT
    req_del_rec : DB_RECORD
  OUTPUT
    rec_del_db : DB_RECORD
END
IMPLEMENTATION ADA delete_record
END

OPERATOR format_response
SPECIFICATION
  INPUT
    file_add_db : DB_RECORD,
    file_del_db : DB_RECORD,
    file_mod_db : DB_RECORD,
    file_retr_msg : DB_RECORD,
    obj_add_db : DB_RECORD,
    obj_del_db : DB_RECORD,
    obj_mod_db : DB_RECORD,
    obj_retr_msg : DB_RECORD,
    rec_add_db : DB_RECORD,
    rec_del_db : DB_RECORD,
    rec_mod_db : DB_RECORD,
    rec_retr_msg : DB_RECORD
  OUTPUT
    respond_msg : MESSAGE
END
IMPLEMENTATION ADA format_response
END

OPERATOR get_user_cmd
SPECIFICATION
  OUTPUT
    data_out : MESSAGE,
    filter_alerts : ALERT,
    filter_data : DB_RECORD,
    filter_maps : MAP,
    filter_msgs : MESSAGE,
    filter_tracks : TRACKS,
    mod_obj_loc : ADMINISTER,
    print_file : MESSAGE,
    req_secure_session : MESSAGE
END
IMPLEMENTATION ADA get_user_cmd
END

OPERATOR handle_query
SPECIFICATION
  INPUT
    filter : TRACKS,
    track_db : TRACKS
  OUTPUT
    respond_tracks : TRACKS
END
IMPLEMENTATION ADA handle_query
END

OPERATOR locate_map
SPECIFICATION
  INPUT
    request_map : MAP
  OUTPUT
    deliver_map : MAP

```

```

IMPLEMENTATION ADA locate_map
END

OPERATOR map_display_db
SPECIFICATION
  INPUT
    ad_del_map : MAP,
    filter_maps : MAP
  OUTPUT
    ad_sub_map : MAP,
    filter_maps : MAP
END
IMPLEMENTATION ADA map_display_db
END

OPERATOR mod_file
SPECIFICATION
  INPUT
    file_mod_db : DB_RECORD,
    req_mod_file : DB_RECORD
  OUTPUT
    file_mod_db : DB_RECORD
END
IMPLEMENTATION ADA mod_file
END

OPERATOR mod_object
SPECIFICATION
  INPUT
    obj_mod_db : DB_RECORD,
    req_mod_obj : DB_RECORD
  OUTPUT
    obj_mod_db : DB_RECORD
END
IMPLEMENTATION ADA mod_object
END

OPERATOR mod_record
SPECIFICATION
  INPUT
    rec_mod_db : DB_RECORD,
    req_mod_rec : DB_RECORD
  OUTPUT
    rec_mod_db : DB_RECORD
END
IMPLEMENTATION ADA mod_record
END

OPERATOR mount_device
SPECIFICATION
  INPUT
    administer_device : DEVICE,
    device_status : BOOLEAN
  OUTPUT
    device_status : BOOLEAN
END
IMPLEMENTATION ADA mount_device
END

OPERATOR msg_display_db
SPECIFICATION

END

INPUT
  ad_del_msgs : MESSAGE,
  filter_msgs : MESSAGE
OUTPUT
  ad_sub_msgs : MESSAGE,
  filter_msgs : MESSAGE
END
IMPLEMENTATION ADA msg_display_db
END

OPERATOR msg_handle_query
SPECIFICATION
  INPUT
    msg_filter : MESSAGE,
    msg_message_db : MESSAGE
  OUTPUT
    respond_msgs : MESSAGE
END
IMPLEMENTATION ADA msg_handle_query
END

OPERATOR msg_out_manager
SPECIFICATION
  INPUT
    data_out : MESSAGE
  OUTPUT
    msg_out : MESSAGE
END
IMPLEMENTATION ADA msg_out_manager
END

OPERATOR msg_update_filter
SPECIFICATION
  INPUT
    msg_filter : MESSAGE,
    request_msgs : MESSAGE
  OUTPUT
    msg_filter : MESSAGE
END
IMPLEMENTATION ADA msg_update_filter
END

OPERATOR network
SPECIFICATION
  INPUT
    bits_out : BITS
  OUTPUT
    bits_in : BITS
END
IMPLEMENTATION ADA network
END

OPERATOR network_interface_in
SPECIFICATION
  INPUT
    bits_in : BITS
  OUTPUT
    data_str_in : MESSAGE
END
IMPLEMENTATION ADA network_interface_in
END

```

```

OPERATOR network_interface_out
SPECIFICATION
INPUT
    FTP_out : MESSAGE,
    HTTP_out : MESSAGE,
    SMTP_out : MESSAGE,
    SNMP_out : MESSAGE,
    UDP_out : MESSAGE
OUTPUT
    bits_out : BITS
END
IMPLEMENTATION ADA network_interface_out

END

OPERATOR print_manager
SPECIFICATION
INPUT
    print_file : MESSAGE,
    print_response : MESSAGE
OUTPUT
    print_req : MESSAGE
END
IMPLEMENTATION ADA print_manager

END

OPERATOR resolve_alerts
SPECIFICATION
INPUT
    alerts_filter : TRACKS,
    alerts_message_db : DB_RECORD
OUTPUT
    respond_alerts : ALERT
END
IMPLEMENTATION ADA resolve_alerts

END

OPERATOR resolve_data_type
SPECIFICATION
INPUT
    req_data : DB_RECORD
OUTPUT
    req_data_type : DB_RECORD
END
IMPLEMENTATION ADA resolve_data_type

END

OPERATOR resolve_request_type
SPECIFICATION
INPUT
    req_data_type : DB_RECORD
OUTPUT
    req_add_obj : DB_RECORD,
    req_add_rec : DB_RECORD,
    req_del_obj : DB_RECORD,
    req_del_rec : DB_RECORD,
    req_mod_obj : DB_RECORD,
    req_mod_rec : DB_RECORD
END

req_retr_rec : DB_RECORD
IMPLEMENTATION ADA retrieve_record

END

OPERATOR retrieve_object
SPECIFICATION
INPUT
    req_retr_obj : DB_RECORD
OUTPUT
    obj_retr_msg : DB_RECORD
END
IMPLEMENTATION ADA retrieve_object

END

OPERATOR retrieve_file
SPECIFICATION
INPUT
    req_retr_file : DB_RECORD
OUTPUT
    file_retr_msg : DB_RECORD
END
IMPLEMENTATION ADA retrieve_file

END

OPERATOR retrieve_resource_loc
SPECIFICATION
INPUT
    mod_obj_loc : ADMINISTER,
    req_resource : MESSAGE
OUTPUT
    mod_obj_loc : ADMINISTER,
    resource_phys_loc : MESSAGE
END
IMPLEMENTATION ADA resolve_resource_loc

END

OPERATOR security_manager
SPECIFICATION
INPUT
    iss_certificate : CERTIFICATE,
    iss_key : KEY,
    iss_signature : SIGNATURE,
    msg_out : MESSAGE,
    req_secure_session : MESSAGE
OUTPUT
    iss_certificate : CERTIFICATE,
    iss_key : KEY,
    iss_signature : SIGNATURE,
    req_certificate : CERTIFICATE,

```

```

secure_msg_out : MESSAGE
END
IMPLEMENTATION ADA security_manager

END

OPERATOR server_thread_manager
SPECIFICATION
INPUT
    FTP_msg_in : MESSAGE,
    HTTP_msg_in : MESSAGE,
    SMTP_msg_in : MESSAGE,
    SNMP_msg_in : MESSAGE,
    UDP_msg_in : MESSAGE,
    deliver_map : MAP,
    device_status : BOOLEAN,
    issue_certificate : CERTIFICATE,
    issue_key : KEY,
    issue_signature : SIGNATURE,
    job_spooled_msg : MESSAGE,
    new_time : TIMESTAMP,
    request_file : MESSAGE,
    resource_phys_loc : MESSAGE,
    respond_alerts : ALERT,
    respond_msg : MESSAGE,
    respond_msgs : MESSAGE,
    respond_template : MESSAGE,
    respond_tracks : TRACKS,
    respond_valid_tracks : TRACKS,
    srv_response : MESSAGE,
    subscribe_db_changes : DB_RECORD,
    subscribe_tracks : TRACKS,
    valid_client_req : MESSAGE
OUTPUT
    administer_device : DEVICE,
    cs_del_tracks : TRACKS,
    feed_msgs : MESSAGE,
    print_request : MESSAGE,
    receive_file : MESSAGE,
    req_alerts : ALERT,
    req_data : DB_RECORD,
    req_resource : MESSAGE,
    req_template : MESSAGE,
    req_tracks : TRACKS,
    request_certificate : CERTIFICATE,
    request_key : KEY,
    request_map : MAP,
    request_msgs : MESSAGE,
    request_signature : SIGNATURE,
    request_tracks : TRACKS,
    respond_db_change : DB_RECORD,
    session_control : MESSAGE,
    session_data : MESSAGE,
    srv_response : MESSAGE
END
IMPLEMENTATION ADA server_thread_manager

END

OPERATOR session_manager
SPECIFICATION
INPUT
    data_str_in : MESSAGE,
    session_control : MESSAGE,
    session_data : MESSAGE
OUTPUT
    FTP_in : MESSAGE,
    FTP_msg_out : MESSAGE,
    HTTP_in : MESSAGE,
    HTTP_msg_out : MESSAGE,
    SMTP_in : MESSAGE,
    SMTP_msg_out : MESSAGE,
    SNMP_in : MESSAGE,
    SNMP_msg_out : MESSAGE,
    UDP_in : MESSAGE,
    UDP_msg_out : MESSAGE,
    session_control : MESSAGE
END
IMPLEMENTATION ADA session_manager

END

OPERATOR spool_file
SPECIFICATION
INPUT
    file : PATH,
    file_name : PATH
OUTPUT
    job_spooled_msg : MESSAGE
END
IMPLEMENTATION ADA spool_file

END

OPERATOR template_database
SPECIFICATION
INPUT
    req_template : MESSAGE
OUTPUT
    respond_template : MESSAGE
END
IMPLEMENTATION ADA template_database

END

OPERATOR track_display_db
SPECIFICATION
INPUT
    ad_del_tracks : TRACKS,
    filter_tracks : TRACKS
OUTPUT
    ad_sub_tracks : TRACKS,
    filter_tracks : TRACKS
END
IMPLEMENTATION ADA track_display_db

END

OPERATOR update_filter
SPECIFICATION
INPUT
    filter : TRACKS,
    req_tracks : TRACKS
OUTPUT
    filter : TRACKS
END
IMPLEMENTATION ADA update_filter

END

OPERATOR update_msgs
SPECIFICATION
INPUT
    alerts_message_db : DB_RECORD,

```

```

feed_msgs : MESSAGE
OUTPUT
  alerts_message_db : DB_RECORD
END
IMPLEMENTATION ADA update_msgs

```

END

```

OPERATOR update_tactical_db
SPECIFICATION

```

```

INPUT
  correl_record_db : DB_RECORD,
  respond_db_change : DB_RECORD
OUTPUT
  correl_record_db : DB_RECORD
END
IMPLEMENTATION ADA update_tactical_db

```

END

```

OPERATOR update_time
SPECIFICATION

```

```

OUTPUT
  new_time : TIMESTAMP
END
IMPLEMENTATION ADA update_time

```

END

```

OPERATOR update_tracks
SPECIFICATION

```

```

INPUT
  feed_tracks : TRACKS,
  track_db : TRACKS
OUTPUT
  track_db : TRACKS
END
IMPLEMENTATION ADA update_tracks

```

END

```

OPERATOR validate_certificate
SPECIFICATION

```

```

INPUT
  issue_certificate : CERTIFICATE,
  request_certificate : CERTIFICATE
OUTPUT
  issue_certificate : CERTIFICATE
END
IMPLEMENTATION ADA validate_certificate

```

END

```

OPERATOR validate_key
SPECIFICATION

```

```

INPUT
  issue_key : KEY,
  request_key : KEY
OUTPUT
  issue_key : KEY
END
IMPLEMENTATION ADA validate_key

```

END

```

INPUT
  issue_signature : SIGNATURE,
  request_signature : SIGNATURE
OUTPUT
  issue_signature : SIGNATURE
END
IMPLEMENTATION ADA validate_signature

```

END

```

package SAAMC_EXCEPTIONS is
  -- PSDL exception type declaration
  type PSDL_EXCEPTION is (UNDECLARED_ADA_EXCEPTION);
end SAAMC_EXCEPTIONS;

package SAAMC_INSTANTIATIONS is
  -- Ada Generic package instantiations
end SAAMC_INSTANTIATIONS;

  with PSDL_TIMERS;
  package SAAMC_TIMERS is
    -- timer instantiations
  end SAAMC_TIMERS;

  -- with/use clauses for atomic type packages
  with ADMINISTER_PKG; use ADMINISTER_PKG;
  with ALERT_PKG; use ALERT_PKG;
  with BITS_PKG; use BITS_PKG;
  with CERTIFICATE_PKG; use CERTIFICATE_PKG;
  with DB_RECORD_PKG; use DB_RECORD_PKG;
  with DEVICE_PKG; use DEVICE_PKG;
  with KEY_PKG; use KEY_PKG;
  with MAP_PKG; use MAP_PKG;
  with MESSAGE_PKG; use MESSAGE_PKG;
  with PARAM_PKG; use PARAM_PKG;
  with PATH_PKG; use PATH_PKG;
  with SIGNATURE_PKG; use SIGNATURE_PKG;
  with TIMESTAMP_PKG; use TIMESTAMP_PKG;
  with TRACKS_PKG; use TRACKS_PKG;

  -- with/use clauses for generated packages.
  with SAAMC_EXCEPTIONS;
  with SAAMC_INSTANTIATIONS; use SAAMC_INSTANTIATIONS;
  with/use clauses for CAPS library packages.
  with PSDL_STREAMS; use PSDL_STREAMS;
  package SAAMC_STREAMS is

    -- Local stream instantiations

    package DS_FTP_MSG_IN_SERVER_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_HTTP_MSG_IN_SERVER_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_SMP_MSG_IN_SERVER_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_SMP_MSG_IN_SERVER_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_UDP_MSG_IN_SERVER_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_AD_SUB_ALERTS_CLIENT_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(ALERT);

    package DS_AD_SUB_DATA_CLIENT_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);

    package DS_AD_SUB_MAP_CLIENT_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MAP);

    package DS_AD_SUB_MSGS_CLIENT_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_AD_SUB_TRACKS_CLIENT_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(TRACKS);

    package DS_ADMINISTER_DEVICE_MCOUNT_DEVICE is new
      PSDL_STREAMS.SAMPLED_BUFFER(DEVICE);

    package DS_BITS_IN_NETWORK_INTERFACE_IN is new
      PSDL_STREAMS.SAMPLED_BUFFER(BITS);

    package DS_CS_DEL_TRACKS_CORREL_UPDATE_TRACKS is new
      PSDL_STREAMS.SAMPLED_BUFFER(TRACKS);

    package DS_DATA_OUT_MSG_OUT_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_FEED_MSGS_ARCHIVE_MSGS is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_FEED_MSGS_UPDATE_MSGS is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_FEED_TRACKS_UPDATE_TRACKS is new
      PSDL_STREAMS.SAMPLED_BUFFER(TRACKS);

    package DS_NEW_TIME_SERVER_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(TIMESTAMP);

    package DS_PRINT_FILE_PRINT_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_PRINT_REQ_CLIENT_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_PRINT_REQUEST_CHECK_FOR_FILE is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_RECEIVE_FILE_CHECK_FOR_FILE is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_REQ_ALERTS_ALERTS_UPDATE_FILTER is new
      PSDL_STREAMS.SAMPLED_BUFFER(ALERT);

    package DS_REQ_CERTIFICATE_CLIENT_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(CERTIFICATE);

    package DS_REQ_DATA_RESOLVE_DATA_TYPE is new
      PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);

    package DS_REQ_KEY_CLIENT_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(KEY);

    package DS_REQ_RESOURCE_RESOLVE_RESOURCE_LOC is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_REQ_SECURE_SESSION_SECURITY_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_REQ_SIGNATURE_CLIENT_THREAD_MANAGER is new
      PSDL_STREAMS.SAMPLED_BUFFER(SIGNATURE);

    package DS_REQ_TEMPLATE_TEMPLATE_DATABASE is new
      PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);

    package DS_REQ_TRACKS_UPDATE_FILTER is new
      PSDL_STREAMS.SAMPLED_BUFFER(TRACKS);

    package DS_REQUEST_CERTIFICATE_VALIDATE_CERTIFICATE is new
      PSDL_STREAMS.SAMPLED_BUFFER(CERTIFICATE);

```

```
package DS_REQUEST_KEY_VALIDATE_KEY is new
  PSDL_STREAMS.SAMPLED_BUFFER(KEY);
package DS_REQUEST_MAP_LOCATE_MAP is new
  PSDL_STREAMS.SAMPLED_BUFFER(MAP);
package DS_REQUEST_MSGS_MSG_UPDATE_FILTER is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_REQUEST_SIGNATURE_VALIDATE_SIGNATURE is new
  PSDL_STREAMS.SAMPLED_BUFFER(SIGNATURE);
package DS_REQUEST_TRACKS_CORREL_UPDATE_FILTER is new
  PSDL_STREAMS.SAMPLED_BUFFER(TRACKS);
package DS_RESPOND_DB_CHANGE_UPDATE_TACTICAL_DB is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_SECURE_MSG_OUT_CLIENT_THREAD_MANAGER is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_MSG_OUT_SECURITY_MANAGER is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_FTP_IN_FTP_PROCESSOR_IN is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_FTP_OUT_FTP_PROCESSOR_OUT is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_FTP_OUT_NETWORK_INTERFACE_OUT is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_HTTP_IN_HTTP_PROCESSOR_IN is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_HTTP_OUT_HTTP_PROCESSOR_OUT is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_HTTP_OUT_NETWORK_INTERFACE_OUT is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_SMTP_IN_SMTP_PROCESSOR_IN is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_SMTP_OUT_SMTP_PROCESSOR_OUT is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_SMTP_OUT_NETWORK_INTERFACE_OUT is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_SMTP_IN_SMTP_PROCESSOR_IN is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_SMTP_OUT_SMTP_PROCESSOR_OUT is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_SMTP_OUT_NETWORK_INTERFACE_OUT is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_UDP_IN_UDP_PROCESSOR_IN is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_UDP_OUT_UDP_PROCESSOR_OUT is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
```

```
PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_DATA_STR_IN_SESSION_MANAGER is new
  PSDL_STREAMS.SAMPLED_BUFFER(MESSAGE);
package DS_VALID_TRACKS_CORREL_HANDLE_QUERY is new
  PSDL_STREAMS.SAMPLED_BUFFER(TRACKS);
package DS_FILE_RETR_MSG_FORMAT_RESPONSE is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_OBJ_RETR_MSG_FORMAT_RESPONSE is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REC_RETR_MSG_FORMAT_RESPONSE is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_ADD_FILE_ADD_FILE is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_ADD_OBJ_ADD_OBJECT is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_ADD_REC_ADD_RECORD is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_DATA_TYPE_RESOLVE_REQUEST_TYPE is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_DEL_FILE_DELETE_FILE is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_DEL_OBJ_DELETE_OBJECT is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_DEL_REC_DELETE_RECORD is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_MOD_FILE_MOD_FILE is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_MOD_OBJ_MOD_OBJECT is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_MOD_REC_MOD_RECORD is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_RETR_FILE_RETRIEVE_FILE is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_RETR_OBJ_RETRIEVE_OBJECT is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_REQ_RETR_REC_RETRIEVE_RECORD is new
  PSDL_STREAMS.SAMPLED_BUFFER(DB_RECORD);
package DS_FILE_SPOOL_FILE is new
  PSDL_STREAMS.SAMPLED_BUFFER(PATH);
package DS_FILE_NAME_SPOOL_FILE is new
  PSDL_STREAMS.SAMPLED_BUFFER(PATH);
package DS_SCREEN_PARAM_BUILD_FILE is new
  PSDL_STREAMS.SAMPLED_BUFFER(PARAM);
```





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```

procedure udp_processor_in_driver;
procedure udp_processor_out_driver;
procedure network_interface_in_driver;
procedure network_interface_out_driver;
procedure session_manager_driver;
procedure correl_handle_query_driver;
procedure correl_update_filter_driver;
procedure correl_update_tracks_driver;
procedure correlate_tracks_driver;
procedure update_tactical_db_driver;
procedure add_file_driver;
procedure add_object_driver;
procedure add_record_driver;
procedure delete_file_driver;
procedure delete_object_driver;
procedure delete_record_driver;
procedure format_response_driver;
procedure mod_file_driver;
procedure mod_object_driver;
procedure mod_record_driver;
procedure resolve_data_type_driver;
procedure resolve_request_type_driver;
procedure retrieve_file_driver;
procedure retrieve_object_driver;
procedure retrieve_record_driver;
procedure mount_device_driver;
procedure locate_map_driver;
procedure archive_msgs_driver;
procedure msg_handle_query_driver;
procedure msg_update_filter_driver;
procedure template_database_driver;
procedure resolve_resource_loc_driver;
procedure build_file_driver;
procedure check_for_file_driver;
procedure spool_file_driver;
procedure validate_certificate_driver;
procedure validate_key_driver;
procedure validate_signature_driver;
procedure update_time_driver;
procedure handle_query_driver;
procedure update_filter_driver;
procedure update_tracks_driver;
procedure business_rules_manager_driver;
procedure client_thread_manager_driver;
procedure server_thread_manager_driver;
end SAAMC_drivers;

-- with/use clauses for atomic components.
with administrator_pkg; use administrator_pkg;
with alert_pkg; use alert_pkg;
with bits_pkg; use bits_pkg;
with certificate_pkg; use certificate_pkg;
with db_record_pkg; use db_record_pkg;
with device_pkg; use device_pkg;
with key_pkg; use key_pkg;
with map_pkg; use map_pkg;
with message_pkg; use message_pkg;
with param_pkg; use param_pkg;
with path_pkg; use path_pkg;
with signature_pkg; use signature_pkg;
with timestamp_pkg; use timestamp_pkg;
with tracks_pkg; use tracks_pkg;
with ftp_processor_in_pkg; use ftp_processor_in_pkg;
with ftp_processor_out_pkg; use ftp_processor_out_pkg;
with http_processor_in_pkg; use http_processor_in_pkg;
with http_processor_out_pkg; use http_processor_out_pkg;
with smtp_processor_in_pkg; use smtp_processor_in_pkg;

with smtp_processor_out_pkg; use smtp_processor_out_pkg;
with snmp_processor_in_pkg; use snmp_processor_in_pkg;
with snmp_processor_out_pkg; use snmp_processor_out_pkg;
with tadbil_j_pkg; use tadbil_j_pkg;
with udp_processor_in_pkg; use udp_processor_in_pkg;
with udp_processor_out_pkg; use udp_processor_out_pkg;
with add_file_pkg; use add_file_pkg;
with add_object_pkg; use add_object_pkg;
with add_record_pkg; use add_record_pkg;
with alerts_display_db_pkg; use alerts_display_db_pkg;
with alerts_update_filter_pkg; use alerts_update_filter_pkg;
with archive_msgs_pkg; use archive_msgs_pkg;
with build_file_pkg; use build_file_pkg;
with business_rules_manager_pkg; use business_rules_manager_pkg;
with check_for_file_pkg; use check_for_file_pkg;
with client_thread_manager_pkg; use client_thread_manager_pkg;
with correl_handle_query_pkg; use correl_handle_query_pkg;
with correl_update_filter_pkg; use correl_update_filter_pkg;
with correl_update_tracks_pkg; use correl_update_tracks_pkg;
with correlate_tracks_pkg; use correlate_tracks_pkg;
with data_display_db_pkg; use data_display_db_pkg;
with delete_file_pkg; use delete_file_pkg;
with delete_object_pkg; use delete_object_pkg;
with delete_record_pkg; use delete_record_pkg;
with format_response_pkg; use format_response_pkg;
with get_user_cmd_pkg; use get_user_cmd_pkg;
with handle_query_pkg; use handle_query_pkg;
with locate_map_pkg; use locate_map_pkg;
with map_display_db_pkg; use map_display_db_pkg;
with mod_file_pkg; use mod_file_pkg;
with mod_object_pkg; use mod_object_pkg;
with mod_record_pkg; use mod_record_pkg;
with mount_device_pkg; use mount_device_pkg;
with msg_display_db_pkg; use msg_display_db_pkg;
with msg_handle_query_pkg; use msg_handle_query_pkg;
with msg_out_manager_pkg; use msg_out_manager_pkg;
with msg_update_filter_pkg; use msg_update_filter_pkg;
with network_pkg; use network_pkg;
with network_interface_in_pkg; use network_interface_in_pkg;
with network_interface_out_pkg; use network_interface_out_pkg;
with print_manager_pkg; use print_manager_pkg;
with resolve_alerts_pkg; use resolve_alerts_pkg;
with resolve_data_type_pkg; use resolve_data_type_pkg;
with resolve_request_type_pkg; use resolve_request_type_pkg;
with resolve_resource_loc_pkg; use resolve_resource_loc_pkg;
with retrieve_file_pkg; use retrieve_file_pkg;
with retrieve_object_pkg; use retrieve_object_pkg;
with retrieve_record_pkg; use retrieve_record_pkg;
with security_manager_pkg; use security_manager_pkg;
with server_thread_manager_pkg; use server_thread_manager_pkg;
with session_manager_pkg; use session_manager_pkg;
with spool_file_pkg; use spool_file_pkg;
with template_database_pkg; use template_database_pkg;
with track_display_db_pkg; use track_display_db_pkg;
with update_filter_pkg; use update_filter_pkg;
with update_msgs_pkg; use update_msgs_pkg;
with update_tactical_db_pkg; use update_tactical_db_pkg;
with update_time_pkg; use update_time_pkg;
with update_tracks_pkg; use update_tracks_pkg;
with validate_certificate_pkg; use validate_certificate_pkg;
with validate_key_pkg; use validate_key_pkg;
with validate_signature_pkg; use validate_signature_pkg;

-- with/use clauses for generated packages.
with saamc_exceptions; use saamc_exceptions;
with saamc_streams; use saamc_streams;
with saamc_timers; use saamc_timers;
with saamc_instantiations; use saamc_instantiations;

```

```
-- with/use clauses for CABS library packages.
with DS_DEBUG_PKG; use DS_DEBUG_PKG;
with PSDL_STREAMS; use PSDL_STREAMS;
with PSDL_TIMERS;
package body SAAMC_DRIVERS is
```

```
  procedure TADIL_J_DRIVER is
    LV_FEED_TRACKS : TRACKS_PKG.TRACKS;
```

```
    EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
    EXCEPTION_ID: PSDL_EXCEPTION;
```

```
  begin
    -- Data trigger checks.
```

```
  -- Data stream reads.
```

```
  -- Execution trigger condition check.
    if True then
```

```
    begin
```

```
      TADIL_J(
        FEED_TRACKS => LV_FEED_TRACKS);
```

```
    exception
```

```
      when others =>
```

```
        DS_DEBUG.UNDECLARED_EXCEPTION("TADIL_J");
```

```
        EXCEPTION_HAS_OCCURRED := true;
```

```
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
```

```
      end;
```

```
    else return;
```

```
  end if;
```

```
-- Exception Constraint translations.
```

```
-- Other constraint option translations.
```

```
--Unconditional output translations.
```

```
  if not EXCEPTION_HAS_OCCURRED then
```

```
    begin
```

```
      DS_FEED_TRACKS_UPDATE_TRACKS.BUFFER.WRITE(LV_FEED_TRACKS);
```

```
    exception
```

```
      when BUFFER_OVERFLOW =>
```

```
        DS_DEBUG.BUFFER_OVERFLOW("FEED_TRACKS_UPDATE_TRACKS", "TADIL_J");
```

```
    end;
```

```
  end if;
```

```
-- PSDL Exception handler.
```

```
  if EXCEPTION_HAS_OCCURRED then
```

```
    DS_DEBUG.UNHANDLED_EXCEPTION(
```

```
      "TADIL_J",
```

```
      PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
```

```
  end if;
```

```
end TADIL_J_DRIVER;
```

```
procedure GET_USER_CMD_DRIVER is
```

```
  LV_DATA_OUT : MESSAGE_PKG.MESSAGE;
```

```
  LV_FILTER_ALERTS : ALERT_PKG.ALERT;
```

```
  LV_FILTER_DATA : DB_RECORD_PKG.DB_RECORD;
```

```
  LV_FILTER_MAPS : MAP;
```

```
  LV_FILTER_MSGS : MESSAGE_PKG.MESSAGE;
```

```
  LV_FILTER_TRACKS : TRACKS_PKG.TRACKS;
```

```
  LV_MOD_OBJ_LOC : ADMINISTER_PKG.ADMINISTER;
```

```
  LV_MOD_RULES : ADMINISTER_PKG.ADMINISTER;
```

```
  LV_PRINT_FILE : MESSAGE_PKG.MESSAGE;
```

```
  LV_REQ_SECURE_SESSION : MESSAGE_PKG.MESSAGE;
```

```
exception HAS_OCCURRED: BOOLEAN := FALSE;
```

```
  begin
    -- Data trigger checks.
```

```
  -- Data stream reads.
```

```
  -- Execution trigger condition check.
    if True then
```

```
    begin
```

```
      GET_USER_CMD(
```

```
        DATA_OUT => LV_DATA_OUT,
```

```
        FILTER_ALERTS => LV_FILTER_ALERTS,
```

```
        FILTER_DATA => LV_FILTER_DATA,
```

```
        FILTER_MAPS => LV_FILTER_MAPS,
```

```
        FILTER_MSGS => LV_FILTER_MSGS,
```

```
        FILTER_TRACKS => LV_FILTER_TRACKS,
```

```
        MOD_OBJ_LOC => LV_MOD_OBJ_LOC,
```

```
        MOD_RULES => LV_MOD_RULES,
```

```
        PRINT_FILE => LV_PRINT_FILE,
```

```
        REQ_SECURE_SESSION => LV_REQ_SECURE_SESSION);
```

```
    exception
```

```
      when others =>
```

```
        DS_DEBUG.UNDECLARED_EXCEPTION("GET_USER_CMD");
```

```
        EXCEPTION_HAS_OCCURRED := true;
```

```
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
```

```
      end;
```

```
    else return;
```

```
  end if;
```

```
-- Exception Constraint translations.
```

```
-- Other constraint option translations.
```

```
--Unconditional output translations.
```

```
  if not EXCEPTION_HAS_OCCURRED then
```

```
    begin
```

```
      DS_DATA_OUT_MSG_OUT_MANAGER.BUFFER.WRITE(LV_DATA_OUT);
```

```
    exception
```

```
      when BUFFER_OVERFLOW =>
```

```
        DS_DEBUG.BUFFER_OVERFLOW("DATA_OUT_MSG_OUT_MANAGER", "GET_USER_CMD");
```

```
    end;
```

```
  end if;
```

```
  if not EXCEPTION_HAS_OCCURRED then
```

```
    begin
```

```
      DS_FILTER_ALERTS_ALERTS_DISPLAY_DB.BUFFER.WRITE(LV_FILTER_ALERTS);
```

```
    exception
```

```
      when BUFFER_OVERFLOW =>
```

```
        DS_DEBUG.BUFFER_OVERFLOW("FILTER_ALERTS_ALERTS_DISPLAY_DB", "GET_USER_CM
```

```
D");
```

```
    end;
```

```
  end if;
```

```
  if not EXCEPTION_HAS_OCCURRED then
```

```
    begin
```

```
      DS_FILTER_DATA_DATA_DISPLAY_DB.BUFFER.WRITE(LV_FILTER_DATA);
```

```
    exception
```

```
      when BUFFER_OVERFLOW =>
```

```
        DS_DEBUG.BUFFER_OVERFLOW("FILTER_DATA_DATA_DISPLAY_DB", "GET_USER_CMD");
```

```
    end;
```

```
  end if;
```

```
  if not EXCEPTION_HAS_OCCURRED then
```

```
    begin
```

```
      DS_FILTER_MAPS_MAP_DISPLAY_DB.BUFFER.WRITE(LV_FILTER_MAPS);
```

```
    exception
```

```
      when BUFFER_OVERFLOW =>
```

```
        DS_DEBUG.BUFFER_OVERFLOW("FILTER_MAPS_MAP_DISPLAY_DB", "GET_USER_CMD");
```

```
    end;
```

```
  end if;
```

```

begin
    DS_FILTER.MSGS_MSG_DISPLAY_DB.BUFFER.WRITE(LV_FILTER.MSGS);
exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("FILTER.MSGS_MSG_DISPLAY_DB", "GET_USER_CMD");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
    DS_FILTER.TRACKS_TRACK_DISPLAY_DB.BUFFER.WRITE(LV_FILTER.TRACKS);
exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("FILTER.TRACKS_TRACK_DISPLAY_DB", "GET_USER_CMD");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
    DS_MOD_OBJ_LOC_RESOLVE_RESOURCE_LOC.BUFFER.WRITE(LV_MOD_OBJ_LOC);
exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("MOD_OBJ_LOC_RESOLVE_RESOURCE_LOC", "GET_USER_CMD");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
    DS_MOD_RULES_BUSINESS_RULES_MANAGER.BUFFER.WRITE(LV_MOD_RULES);
exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("MOD_RULES_BUSINESS_RULES_MANAGER", "GET_USER_CMD");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
    DS_PRINT_FILE_PRINT_MANAGER.BUFFER.WRITE(LV_PRINT_FILE);
exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("PRINT_FILE_PRINT_MANAGER", "GET_USER_CMD");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
    DS_REQ_SECURE_SESSION_SECURITY_MANAGER.BUFFER.WRITE(LV_REQ_SECURE_SESSION);
exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("REQ_SECURE_SESSION_SECURITY_MANAGER", "GET_USER_CM
D");
end;
end if;

-- PSDJ Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "GET_USER_CMD",
        PSDJ_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end GET_USER_CMD_DRIVER;

procedure NETWORK_DRIVER is
    LV_BITS_OUT : BITS_PKG.BITS;
    LV_BITS_IN : BITS_PKG.BITS;
exception HAS_OCCURRED : BOOLEAN := FALSE;
EXCEPTION_ID : PSDJ_EXCEPTION;
begin
    -- Data trigger checks.
    -- Data stream reads.
begin
    DS_BITS_OUT_NETWORK.BUFFER.READ(LV_BITS_OUT);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("BITS_OUT_NETWORK", "NETWORK");
end;

    -- Execution trigger condition check.
    if True then
begin
        NETWORK(
            BITS_OUT => LV_BITS_OUT,
            BITS_IN => LV_BITS_IN);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("NETWORK");
                EXCEPTION_HAS_OCCURRED := true;
                EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
    else return;
    end if;

    -- Exception Constraint translations.
    -- Other constraint option translations.
    -- Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
begin
        DS_BITS_IN_NETWORK_INTERFACE_IN.BUFFER.WRITE(LV_BITS_IN);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("BITS_IN_NETWORK_INTERFACE_IN", "NETWORK");
        end;
    end if;

    -- PSDJ Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "NETWORK",
            PSDJ_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
    end NETWORK_DRIVER;

    procedure ALERTS_DISPLAY_DB_DRIVER is
        LV_AD_DEL_ALERTS : ALERT_PKG.ALERT;
        LV_AD_SUB_ALERTS : ALERT_PKG.ALERT;
        LV_FILTER_ALERTS : ALERT_PKG.ALERT;
        EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
        EXCEPTION_ID : PSDJ_EXCEPTION;
    begin
        -- Data trigger checks.
        -- Data stream reads.
begin
        DS_AD_DEL_ALERTS_ALERTS_DISPLAY_DB.BUFFER.READ(LV_AD_DEL_ALERTS);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW("AD_DEL_ALERTS_ALERTS_DISPLAY_DB", "ALERTS_DISPL
AY_DB");
        end;
    begin

```

```

DS_FILTER.ALERTS.ALERTS_DISPLAY_DB.BUFFER.READ(LV_FILTER.ALERTS);
exception
when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("FILTER.ALERTS.ALERTS_DISPLAY_DB", "ALERTS_DISPLAY_DB");
end;

```

-- Execution trigger condition check.

```

if True then
begin
    ALERTS_DISPLAY_DB(
        AD_DEL.ALERTS => LV_AD_DEL.ALERTS,
        AD_SUB.ALERTS => LV_AD_SUB.ALERTS,
        FILTER.ALERTS => LV_FILTER.ALERTS);
exception
when others =>
    DS_DEBUG.UNDECLARED_EXCEPTION("ALERTS_DISPLAY_DB");
    EXCEPTION_HAS_OCCURRED := true;
    EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;
else return;
end if;

```

-- Exception Constraint translations.

-- Other constraint option translations.

-- Unconditional output translations.

```

if not EXCEPTION_HAS_OCCURRED then
begin
    DS_AD_SUB.ALERTS.CLIENT_THREAD_MANAGER.BUFFER.WRITE(LV_AD_SUB.ALERTS);
exception
when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("AD_SUB.ALERTS.CLIENT_THREAD_MANAGER", "ALERTS_DISPLAY_DB");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
    DS_FILTER.ALERTS.ALERTS_DISPLAY_DB.BUFFER.WRITE(LV_FILTER.ALERTS);
exception
when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("FILTER.ALERTS.ALERTS_DISPLAY_DB", "ALERTS_DISPLAY_DB");
end;
end if;

```

-- PSDL Exception handler.

```

if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "ALERTS_DISPLAY_DB",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end ALERTS_DISPLAY_DB_DRIVER;

```

procedure DATA\_DISPLAY\_DB\_DRIVER is

```

LV_AD_DEL_DATA : DB_RECORD_PKG.DB_RECORD;
LV_AD_SUB_DATA : DB_RECORD_PKG.DB_RECORD;
LV_FILTER_DATA : DB_RECORD_PKG.DB_RECORD;
EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
EXCEPTION_ID : PSDL_EXCEPTION;
begin

```

-- Data trigger checks.

```

begin
    DS_AD_DEL_DATA_DISPLAY_DB.BUFFER.READ(LV_AD_DEL_DATA);
exception
when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("AD_DEL_DATA_DISPLAY_DB", "DATA_DISPLAY_DB");
end;

```

```

begin
    DS_FILTER_DATA_DISPLAY_DB.BUFFER.READ(LV_FILTER_DATA);
exception
when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("FILTER_DATA_DISPLAY_DB", "DATA_DISPLAY_DB");
end;

```

-- Execution trigger condition check.

```

if True then
begin
    DATA_DISPLAY_DB(
        AD_DEL_DATA => LV_AD_DEL_DATA,
        AD_SUB_DATA => LV_AD_SUB_DATA,
        FILTER_DATA => LV_FILTER_DATA);
exception
when others =>
    DS_DEBUG.UNDECLARED_EXCEPTION("DATA_DISPLAY_DB");
    EXCEPTION_HAS_OCCURRED := true;
    EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;
else return;
end if;

```

-- Exception Constraint translations.

-- Other constraint option translations.

```

-- Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
begin
    DS_AD_SUB_DATA.CLIENT_THREAD_MANAGER.BUFFER.WRITE(LV_AD_SUB_DATA);
exception
when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("AD_SUB_DATA_CLIENT_THREAD_MANAGER", "DATA_DISPLAY_DB");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
    DS_FILTER_DATA_DISPLAY_DB.BUFFER.WRITE(LV_FILTER_DATA);
exception
when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("FILTER_DATA_DISPLAY_DB", "DATA_DISPLAY_DB");
end;
end if;

```

```

");
end;
end if;

```

-- PSDL Exception handler.

```

if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "DATA_DISPLAY_DB",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end DATA_DISPLAY_DB_DRIVER;

```

procedure MAP\_DISPLAY\_DB\_DRIVER is



```

if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "MSG_DISPLAY.DB",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end MSG_DISPLAY_DB_DRIVER;

procedure MSG_OUT_MANAGER_DRIVER is
    LV_DATA_OUT : MESSAGE_PKG.MESSAGE;
    LV_MSG_OUT : MESSAGE_PKG.MESSAGE;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.

    -- Data stream reads.
    begin
        DS_DATA_OUT_MSG_OUT_MANAGER.BUFFER.READ(LV_DATA_OUT);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("DATA_OUT_MSG_OUT_MANAGER", "MSG_OUT_MANAGER");
    end;

    -- Execution trigger condition check.
    if true then
        begin
            MSG_OUT_MANAGER(
                DATA_OUT => LV_DATA_OUT,
                MSG_OUT => LV_MSG_OUT);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("MSG_OUT_MANAGER");
                EXCEPTION_HAS_OCCURRED := true;
                EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
            end;
        else return;
        end if;

    -- Exception Constraint translations.

    -- Other constraint option translations.

    -- Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_MSG_OUT_SECURITY_MANAGER.BUFFER.WRITE(LV_MSG_OUT);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("MSG_OUT_SECURITY_MANAGER", "MSG_OUT_MANAGER");
            end;
        end if;

    -- PSDL Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "MSG_OUT_MANAGER",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end MSG_OUT_MANAGER_DRIVER;

procedure PRINT_MANAGER_DRIVER is
    LV_PRINT_FILE : MESSAGE_PKG.MESSAGE;
    LV_PRINT_RESPONSE : MESSAGE_PKG.MESSAGE;
    LV_PRINT_RESPONSE : MESSAGE_PKG.MESSAGE;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.

    -- Data stream reads.
    begin
        DS_PRINT_FILE_PRINT_MANAGER.BUFFER.READ(LV_PRINT_FILE);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("PRINT_FILE_PRINT_MANAGER", "PRINT_MANAGER");
    end;
    begin
        DS_PRINT_RESPONSE_PRINT_MANAGER.BUFFER.READ(LV_PRINT_RESPONSE);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("PRINT_RESPONSE_PRINT_MANAGER", "PRINT_MANAGER");
    end;

    -- Execution trigger condition check.
    if true then
        begin
            PRINT_MANAGER(
                PRINT_FILE => LV_PRINT_FILE,
                PRINT_RESPONSE => LV_PRINT_RESPONSE,
                PRINT_REQ => LV_PRINT_REQ);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("PRINT_MANAGER");
                EXCEPTION_HAS_OCCURRED := true;
                EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
            end;
        else return;
        end if;

    -- Exception Constraint translations.

    -- Other constraint option translations.

    -- Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_PRINT_REQ_CLIENT_THREAD_MANAGER.BUFFER.WRITE(LV_PRINT_REQ);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("PRINT_REQ_CLIENT_THREAD_MANAGER", "PRINT_MANAGER");
            end;
        end if;

    -- PSDL Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "PRINT_MANAGER",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end PRINT_MANAGER_DRIVER;

procedure SECURITY_MANAGER_DRIVER is
    LV_MSG_OUT : MESSAGE_PKG.MESSAGE;
    LV_REQ_SECURE_SESSION : MESSAGE_PKG.MESSAGE;
    LV_ISS_CERTIFICATE : CERTIFICATE_PKG.CERTIFICATE;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.

    -- Data stream reads.
    begin
        DS_PRINT_FILE_PRINT_MANAGER.BUFFER.READ(LV_PRINT_FILE);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("PRINT_FILE_PRINT_MANAGER", "PRINT_MANAGER");
    end;
    begin
        DS_PRINT_RESPONSE_PRINT_MANAGER.BUFFER.READ(LV_PRINT_RESPONSE);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("PRINT_RESPONSE_PRINT_MANAGER", "PRINT_MANAGER");
    end;

    -- Execution trigger condition check.
    if true then
        begin
            SECURITY_MANAGER(
                PRINT_FILE => LV_PRINT_FILE,
                PRINT_RESPONSE => LV_PRINT_RESPONSE,
                PRINT_REQ => LV_PRINT_REQ);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("SECURITY_MANAGER");
                EXCEPTION_HAS_OCCURRED := true;
                EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
            end;
        else return;
        end if;

    -- Exception Constraint translations.

    -- Other constraint option translations.

    -- Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_PRINT_REQ_CLIENT_THREAD_MANAGER.BUFFER.WRITE(LV_PRINT_REQ);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("PRINT_REQ_CLIENT_THREAD_MANAGER", "PRINT_MANAGER");
            end;
        end if;

    -- PSDL Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "SECURITY_MANAGER",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end SECURITY_MANAGER_DRIVER;

```



```

LV_REQ_CERTIFICATE : CERTIFICATE_PKG.CERTIFICATE;
LV_REQ_KEY : KEY_PKG.KEY;
LV_REQ_SIGNATURE : SIGNATURE_PKG.SIGNATURE;
LV_SECURE_MSG_OUT : MESSAGE_PKG.MESSAGE;

EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
EXCEPTION_ID : PSDL_EXCEPTION;

-- Data trigger checks.
begin
    -- Data stream reads.
    begin
        DS_ISS_CERTIFICATE.SECURITY_MANAGER.BUFFER.READ(LV_ISS_CERTIFICATE);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("ISS_CERTIFICATE_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_ISS_KEY_SECURITY_MANAGER.BUFFER.READ(LV_ISS_KEY);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("ISS_KEY_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_ISS_SIGNATURE_SECURITY_MANAGER.BUFFER.READ(LV_ISS_SIGNATURE);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("ISS_SIGNATURE_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_MSG_OUT_SECURITY_MANAGER.BUFFER.READ(LV_MSG_OUT);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("MSG_OUT_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_REQ_SECURE_SESSION_SECURITY_MANAGER.BUFFER.READ(LV_REQ_SECURE_SESSION);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("REQ_SECURE_SESSION_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    -- Execution trigger condition check.
    if True then
        begin
            SECURITY_MANAGER(
                MSG_OUT => LV_MSG_OUT,
                REQ_SECURE_SESSION => LV_REQ_SECURE_SESSION,
                ISS_CERTIFICATE => LV_ISS_CERTIFICATE,
                ISS_KEY => LV_ISS_KEY,
                ISS_SIGNATURE => LV_ISS_SIGNATURE,
                REQ_CERTIFICATE => LV_REQ_CERTIFICATE,
                REQ_KEY => LV_REQ_KEY,
                REQ_SIGNATURE => LV_REQ_SIGNATURE,
                SECURE_MSG_OUT => LV_SECURE_MSG_OUT);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("SECURITY_MANAGER");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
    else return;
    end if;
end if;

-- Exception Constraint translations.
-- Other constraint option translations.
--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
    begin
        DS_ISS_CERTIFICATE.SECURITY_MANAGER.BUFFER.WRITE(LV_ISS_CERTIFICATE);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("ISS_CERTIFICATE_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_ISS_KEY_SECURITY_MANAGER.BUFFER.WRITE(LV_ISS_KEY);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("ISS_KEY_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_ISS_SIGNATURE_SECURITY_MANAGER.BUFFER.WRITE(LV_ISS_SIGNATURE);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("ISS_SIGNATURE_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_MSG_OUT_SECURITY_MANAGER.BUFFER.WRITE(LV_MSG_OUT);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("MSG_OUT_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_REQ_SECURE_SESSION_SECURITY_MANAGER.BUFFER.WRITE(LV_REQ_SECURE_SESSION);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("REQ_SECURE_SESSION_SECURITY_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_REQ_KEY_CLIENT_THREAD_MANAGER.BUFFER.WRITE(LV_REQ_KEY);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("REQ_KEY_CLIENT_THREAD_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_REQ_SIGNATURE_CLIENT_THREAD_MANAGER.BUFFER.WRITE(LV_REQ_SIGNATURE);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("REQ_SIGNATURE_CLIENT_THREAD_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_SECURE_SESSION_CLIENT_THREAD_MANAGER.BUFFER.WRITE(LV_SECURE_SESSION);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("SECURE_SESSION_CLIENT_THREAD_MANAGER", "SECURITY_MANAGER");
    end;

    begin
        DS_SECURE_MSG_OUT_CLIENT_THREAD_MANAGER.BUFFER.WRITE(LV_SECURE_MSG_OUT);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("SECURE_MSG_OUT_CLIENT_THREAD_MANAGER", "SECURITY_MANAGER");
    end;
end;

```

```

end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    if DS_DEBUG.UNHANDLED_EXCEPTION(
        "SECURITY_MANAGER",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end SECURITY_MANAGER_DRIVER;

procedure TRACK_DISPLAY_DB_DRIVER is
    LV_AD_DEL_TRACKS : TRACKS_PKG.TRACKS;
    LV_AD_SUB_TRACKS : TRACKS_PKG.TRACKS;
    LV_FILTER_TRACKS : TRACKS_PKG.TRACKS;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.
begin
    -- Data stream reads.
begin
        DS_AD_DEL_TRACKS_TRACK_DISPLAY_DB_BUFFER.READ(LV_AD_DEL_TRACKS);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("AD_DEL_TRACKS_TRACK_DISPLAY_DB", "TRACK_DISPLAY_DB"
);
    end;
begin
        DS_FILTER_TRACKS_TRACK_DISPLAY_DB_BUFFER.READ(LV_FILTER_TRACKS);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("FILTER_TRACKS_TRACK_DISPLAY_DB", "TRACK_DISPLAY_DB"
);
    end;
end;

-- Execution trigger condition check.
if True then
    begin
        TRACK_DISPLAY_DB(
            AD_DEL_TRACKS => LV_AD_DEL_TRACKS,
            AD_SUB_TRACKS => LV_AD_SUB_TRACKS,
            FILTER_TRACKS => LV_FILTER_TRACKS);
    exception
        when others =>
            DS_DEBUG.UNDECLARED_EXCEPTION("TRACK_DISPLAY_DB");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
    else return;
    end if;

-- Exception Constraint translations.
-- Other constraint option translations.

--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
    begin
        DS_AD_SUB_TRACKS_CLIENT_THREAD_MANAGER_BUFFER.WRITE(LV_AD_SUB_TRACKS);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("AD_SUB_TRACKS_CLIENT_THREAD_MANAGER", "TRACK_DISP
AY_DB");
    end;
end;

if not EXCEPTION_HAS_OCCURRED then
    begin
        DS_FILTER_TRACKS_TRACK_DISPLAY_DB_BUFFER.WRITE(LV_FILTER_TRACKS);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("FILTER_TRACKS_TRACK_DISPLAY_DB", "TRACK_DISP
AY_DB");
    end;
end;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    if DS_DEBUG.UNHANDLED_EXCEPTION(
        "TRACK_DISPLAY_DB",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end;

procedure ALERTS_UPDATE_FILTER_DRIVER is
    LV_REQ_ALERTS : ALERT_PKG.ALERT;
    LV_ALERTS_FILTER : TRACKS_PKG.TRACKS;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.
begin
    -- Data stream reads.
begin
        DS_ALERTS_FILTER_ALERTS_UPDATE_FILTER_BUFFER.READ(LV_ALERTS_FILTER);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW(
                "ALERTS_FILTER_ALERTS_UPDATE_FILTER", "ALERTS_UPDATE_FILTER");
    end;
begin
        DS_REQ_ALERTS_ALERTS_UPDATE_FILTER_BUFFER.READ(LV_REQ_ALERTS);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("REQ_ALERTS_ALERTS_UPDATE_FILTER", "ALERTS_UPDAT
E_FILTER");
    end;
end;

-- Execution trigger condition check.
if True then
    begin
        ALERTS_UPDATE_FILTER(
            REQ_ALERTS => LV_REQ_ALERTS,
            ALERTS_FILTER => LV_ALERTS_FILTER);
    exception
        when others =>
            DS_DEBUG.UNDECLARED_EXCEPTION("ALERTS_UPDATE_FILTER");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
    else return;
    end if;

-- Exception Constraint translations.
-- Other constraint option translations.

--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
    begin
        DS_ALERTS_FILTER_ALERTS_UPDATE_FILTER_BUFFER.WRITE(LV_ALERTS_FILTER);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("ALERTS_FILTER_ALERTS_UPDATE_FILTER", "ALERTS_UPD
ATE_FILTER");
    end;
end;
end;

```

```

exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW('ALERTS_FILTER_ALERTS_UPDATE_FILTER', 'ALERTS_UPDAT
E_FILTER');
    end;
begin
    DS_ALERTS_FILTER.RESOLVE_ALERTS.BUFFER.WRITE(LV_ALERTS_FILTER);
exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW('ALERTS_FILTER_RESOLVE_ALERTS', 'ALERTS_UPDATE_FILT
ER');
    end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "ALERTS_UPDATE_FILTER",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end ALERTS_UPDATE_FILTER_DRIVER;

procedure RESOLVE_ALERTS_DRIVER is
    LV_ALERTS_FILTER : TRACKS_PKG.TRACKS;
    LV_ALERTS_MESSAGE_DB : DB_RECORD_PKG.DB_RECORD;
    LV_RESPOND_ALERTS : ALERT_PKG.ALERT;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.
    begin
        -- Data stream reads.
        begin
            DS_ALERTS_FILTER.RESOLVE_ALERTS.BUFFER.READ(LV_ALERTS_FILTER);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW('ALERTS_FILTER_RESOLVE_ALERTS', 'RESOLVE_ALERTS');
            end;
        begin
            DS_ALERTS_MESSAGE_DB.RESOLVE_ALERTS.BUFFER.READ(LV_ALERTS_MESSAGE_DB);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW('ALERTS_MESSAGE_DB_RESOLVE_ALERTS', 'RESOLVE_ALERTS'
            );
        end;
    end;

    -- Execution trigger condition check.
    if True then
        begin
            RESOLVE_ALERTS(
                ALERTS_FILTER => LV_ALERTS_FILTER,
                ALERTS_MESSAGE_DB => LV_ALERTS_MESSAGE_DB,
                RESPOND_ALERTS => LV_RESPOND_ALERTS);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION('RESOLVE_ALERTS');
                EXCEPTION_HAS_OCCURRED := true;
                EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
            end;
        else return;
        end if;

    -- Exception Constraint translations.
    -- Other constraint option translations.

-- Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
    begin
        DS_RESPOND_ALERTS_SERVER.THREAD_MANAGER.BUFFER.WRITE(LV_RESPOND_ALERTS);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW('RESPOND_ALERTS_SERVER_THREAD_MANAGER', 'RESOLV
E_ALERTS');
        end;
    end if;

    -- PSDL Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "RESOLVE_ALERTS",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
        end if;
    end RESOLVE_ALERTS_DRIVER;

    procedure UPDATE_MSGS_DRIVER is
        LV_FEED_MSGS : MESSAGE_PKG.MESSAGE;
        LV_ALERTS_MESSAGE_DB : DB_RECORD_PKG.DB_RECORD;

        EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
        EXCEPTION_ID : PSDL_EXCEPTION;
    begin
        -- Data trigger checks.
        -- Data stream reads.
        begin
            DS_ALERTS_MESSAGE_DB.UPDATE_MSGS.BUFFER.READ(
                LV_ALERTS_MESSAGE_DB);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW('ALERTS_MESSAGE_DB_UPDATE_MSGS', 'UPDATE_MSGS');
            end;
        begin
            DS_FEED_MSGS.UPDATE_MSGS.BUFFER.READ(LV_FEED_MSGS);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW('FEED_MSGS_UPDATE_MSGS', 'UPDATE_MSGS');
            end;
        end;

        -- Execution trigger condition check.
        if True then
            begin
                UPDATE_MSGS(
                    FEED_MSGS => LV_FEED_MSGS,
                    ALERTS_MESSAGE_DB => LV_ALERTS_MESSAGE_DB);
            exception
                when others =>
                    DS_DEBUG.UNDECLARED_EXCEPTION('UPDATE_MSGS');
                    EXCEPTION_HAS_OCCURRED := true;
                    EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
                end;
            else return;
            end if;

            -- Exception Constraint translations.
            -- Other constraint option translations.

-- Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
    begin
        DS_ALERTS_MESSAGE_DB.RESOLVE_ALERTS.BUFFER.WRITE(LV_ALERTS_MESSAGE_DB);

```

```

exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("ALERTS.MESSAGE_DB.RESOLVE_ALERTS", "UPDATE_MSGS");
  end;
begin
  DS_ALERTS.MESSAGE_DB.UPDATE_MSGS.BUFFER.WRITE(LV_ALERTS.MESSAGE_DB);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("ALERTS.MESSAGE_DB.UPDATE_MSGS", "UPDATE_MSGS");
  end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "UPDATE_MSGS",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
  end if;
end UPDATE_MSGS_DRIVER;

procedure FTP_PROCESSOR_IN_DRIVER is
  LV_FTP_IN : MESSAGE_PKG.MESSAGE;
  LV_FTP_MSG_IN : MESSAGE_PKG.MESSAGE;
  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream reads.
  begin
    DS_FTP_IN.FTP_PROCESSOR_IN.BUFFER.READ(LV_FTP_IN);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("FTP_IN.FTP_PROCESSOR_IN", "FTP_PROCESSOR_IN");
    end;
  -- Execution trigger condition check.
  if True then
    begin
      FTP_PROCESSOR_IN(
        FTP_IN => LV_FTP_IN,
        FTP_MSG_IN => LV_FTP_MSG_IN);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("FTP_PROCESSOR_IN");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
    end if;
  -- Exception Constraint translations.
  -- Other constraint option translations.
  -- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_FTP_MSG_IN.SERVER.THREAD_MANAGER.BUFFER.WRITE(LV_FTP_MSG_IN);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("FTP_MSG_IN.SERVER.THREAD_MANAGER", "FTP_PROCESSOR_IN");
    end;
  end;
end;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "FTP_PROCESSOR_IN",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
  end if;
end FTP_PROCESSOR_IN_DRIVER;

procedure FTP_PROCESSOR_OUT_DRIVER is
  LV_FTP_MSG_OUT : MESSAGE_PKG.MESSAGE;
  LV_FTP_OUT : MESSAGE_PKG.MESSAGE;
  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream reads.
  begin
    DS_FTP_MSG_OUT.FTP_PROCESSOR_OUT.BUFFER.READ(LV_FTP_MSG_OUT);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("FTP_MSG_OUT.FTP_PROCESSOR_OUT", "FTP_PROCESSOR_OUT");
    end;
  -- Execution trigger condition check.
  if True then
    begin
      FTP_PROCESSOR_OUT(
        FTP_MSG_OUT => LV_FTP_MSG_OUT,
        FTP_OUT => LV_FTP_OUT);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("FTP_PROCESSOR_OUT");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
    end if;
  -- Exception Constraint translations.
  -- Other constraint option translations.
  -- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_FTP_OUT.NETWORK_INTERFACE.OUT.BUFFER.WRITE(LV_FTP_OUT);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("FTP_OUT.NETWORK_INTERFACE_OUT", "FTP_PROCESSOR_OUT");
    end;
  end if;
  -- PSDL Exception handler.
  if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
      "FTP_PROCESSOR_OUT",
      PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
  end FTP_PROCESSOR_OUT_DRIVER;
end;

```

```

procedure HTTP_PROCESSOR_IN_DRIVER is
  LV_HTTP_IN : MESSAGE_PKG.MESSAGE;
  LV_HTTP_MSG_IN : MESSAGE_PKG.MESSAGE;
  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream reads.
  begin
    DS_HTTP_IN_HTTP_PROCESSOR_IN.BUFFER.READ(LV_HTTP_IN);
    exception
      when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("HTTP_IN_HTTP_PROCESSOR_IN", "HTTP_PROCESSOR_IN");
    end;
  -- Execution trigger condition check.
  if True then
    begin
      HTTP_PROCESSOR_IN(
        HTTP_IN => LV_HTTP_IN,
        HTTP_MSG_IN => LV_HTTP_MSG_IN);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("HTTP_PROCESSOR_IN");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
    end if;
  -- Exception Constraint translations.
  -- Other constraint option translations.
  -- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_HTTP_MSG_IN_SERVER_THREAD_MANAGER.BUFFER.WRITE(LV_HTTP_MSG_IN);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("HTTP_MSG_IN_SERVER_THREAD_MANAGER", "HTTP_PROCESSOR_IN");
      end;
    end if;
  -- PSDL Exception handler.
  if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
      "HTTP_PROCESSOR_IN",
      PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
  end HTTP_PROCESSOR_IN_DRIVER;

procedure HTTP_PROCESSOR_OUT_DRIVER is
  LV_HTTP_MSG_OUT : MESSAGE_PKG.MESSAGE;
  LV_HTTP_OUT : MESSAGE_PKG.MESSAGE;
  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream reads.
  begin
    -- Execution trigger condition check.
    if True then
      begin
        HTTP_PROCESSOR_OUT(
          HTTP_MSG_OUT => LV_HTTP_MSG_OUT,
          HTTP_OUT => LV_HTTP_OUT);
        exception
          when others =>
            DS_DEBUG.UNDECLARED_EXCEPTION("HTTP_PROCESSOR_OUT");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
          end;
        else return;
        end if;
      -- Exception Constraint translations.
      -- Other constraint option translations.
      -- Unconditional output translations.
      if not EXCEPTION_HAS_OCCURRED then
        begin
          DS_HTTP_OUT_NETWORK_INTERFACE_OUT.BUFFER.WRITE(LV_HTTP_OUT);
        exception
          when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW(
              "HTTP_OUT_NETWORK_INTERFACE_OUT", "HTTP_PROCESSOR_OUT");
            end;
          end if;
        -- PSDL Exception handler.
        if EXCEPTION_HAS_OCCURRED then
          DS_DEBUG.UNHANDLED_EXCEPTION(
            "HTTP_PROCESSOR_OUT",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
          end if;
        end HTTP_PROCESSOR_OUT_DRIVER;

procedure SMTP_PROCESSOR_IN_DRIVER is
  LV_SMTP_IN : MESSAGE_PKG.MESSAGE;
  LV_SMTP_MSG_IN : MESSAGE_PKG.MESSAGE;
  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream reads.
  begin
    DS_SMTP_IN_SMTP_PROCESSOR_IN.BUFFER.READ(LV_SMTP_IN);
    exception
      when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("SMTP_IN_SMTP_PROCESSOR_IN", "SMTP_PROCESSOR_IN");
      end;
  -- Execution trigger condition check.
  if True then
    begin

```



```

exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("SNMP_MSG_IN_SERVER_THREAD_MANAGER", "SNMP_PROCESSOR_IN");
    end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "SNMP_PROCESSOR_IN",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end SNMP_PROCESSOR_IN_DRIVER;

procedure SNMP_PROCESSOR_OUT_DRIVER is
    LV_SNMP_MSG_OUT : MESSAGE_PKG.MESSAGE;
    LV_SNMP_OUT : MESSAGE_PKG.MESSAGE;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.

    -- Data stream reads.
    begin
        DS_SNMP_MSG_OUT_SNMP_PROCESSOR_OUT.BUFFER.READ(LV_SNMP_MSG_OUT);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("SNMP_MSG_OUT_SNMP_PROCESSOR_OUT", "SNMP_PROCESSOR_OUT");
    end;

    -- Execution trigger condition check.
    if True then
        begin
            SNMP_PROCESSOR_OUT(
                SNMP_MSG_OUT => LV_SNMP_MSG_OUT,
                SNMP_OUT => LV_SNMP_OUT);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("SNMP_PROCESSOR_OUT");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
    else return;
    end if;

    -- Exception Constraint translations.

    -- Other constraint option translations.

    -- Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_SNMP_OUT_NETWORK_INTERFACE_OUT.BUFFER.WRITE(LV_SNMP_OUT);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("SNMP_OUT_NETWORK_INTERFACE_OUT", "SNMP_PROCESSOR_OUT");
    end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "SNMP_PROCESSOR_OUT_DRIVER",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end SNMP_PROCESSOR_OUT_DRIVER;

procedure UDP_PROCESSOR_IN_DRIVER is
    LV_UDP_IN : MESSAGE_PKG.MESSAGE;
    LV_UDP_MSG_IN : MESSAGE_PKG.MESSAGE;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.

    -- Data stream reads.
    begin
        DS_UDP_IN_UDP_PROCESSOR_IN.BUFFER.READ(LV_UDP_IN);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("UDP_IN_UDP_PROCESSOR_IN", "UDP_PROCESSOR_IN");
    end;

    -- Execution trigger condition check.
    if True then
        begin
            UDP_PROCESSOR_IN(
                UDP_IN => LV_UDP_IN,
                UDP_MSG_IN => LV_UDP_MSG_IN);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("UDP_PROCESSOR_IN");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
    else return;
    end if;

    -- Exception Constraint translations.

    -- Other constraint option translations.

    -- Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_UDP_MSG_IN_SERVER_THREAD_MANAGER.BUFFER.WRITE(LV_UDP_MSG_IN);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("UDP_MSG_IN_SERVER_THREAD_MANAGER", "UDP_PROCESSOR_IN");
    end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "UDP_PROCESSOR_IN",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end UDP_PROCESSOR_IN_DRIVER;

procedure UDP_PROCESSOR_OUT_DRIVER is
    LV_UDP_MSG_OUT : MESSAGE_PKG.MESSAGE;
    LV_UDP_OUT : MESSAGE_PKG.MESSAGE;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;

```

```

-- Data trigger checks.
begin
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("UDP_MSG_OUT_UDP_PROCESSOR_OUT", "UDP_PROCESSOR_OUT"
);
end;

-- Execution trigger condition check.
if True then
  begin
    UDP_PROCESSOR_OUT(
      UDP_MSG_OUT => LV_UDP_MSG_OUT,
      UDP_OUT => LV_UDP_OUT);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("UDP_PROCESSOR_OUT");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
  end if;

-- Exception Constraint translations.

-- Other constraint option translations.

-- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_UDP_OUT_NETWORK_INTERFACE_OUT.BUFFER.WRITE(LV_UDP_OUT);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("UDP_OUT_NETWORK_INTERFACE_OUT", "UDP_PROCESSOR_OUT
");
    end;
  end if;

-- PSDL Exception handler.
  if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
      "UDP_PROCESSOR_OUT",
      PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
  end if;
end UDP_PROCESSOR_OUT_DRIVER;

procedure NETWORK_INTERFACE_IN_DRIVER is
  LV_BITS_IN : BITS_PKG.BITS;
  LV_DATA_STR_IN : MESSAGE_PKG.MESSAGE;
  EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
  EXCEPTION_ID: PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream reads.
  begin
    DS_BITS_IN_NETWORK_INTERFACE_IN_BUFFER.READ(LV_BITS_IN);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("UDP_OUT_NETWORK_INTERFACE_OUT", "UDP_PROCESSOR_OUT"
);
  end;
end;

-- Execution trigger condition check.
if True then
  begin
    NETWORK_INTERFACE_IN(
      BITS_IN => LV_BITS_IN,
      DATA_STR_IN => LV_DATA_STR_IN);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("NETWORK_INTERFACE_IN");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
  end if;

-- Exception Constraint translations.

-- Other constraint option translations.

-- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_DATA_STR_IN_SESSION_MANAGER.BUFFER.WRITE(LV_DATA_STR_IN);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("DATA_STR_IN_SESSION_MANAGER", "NETWORK_INTERFA
CE_IN");
    end;
  end if;

-- PSDL Exception handler.
  if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
      "NETWORK_INTERFACE_IN",
      PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
  end if;
end NETWORK_INTERFACE_IN_DRIVER;

procedure NETWORK_INTERFACE_OUT_DRIVER is
  LV_FTP_OUT : MESSAGE_PKG.MESSAGE;
  LV_HTTP_OUT : MESSAGE_PKG.MESSAGE;
  LV_SMTF_OUT : MESSAGE_PKG.MESSAGE;
  LV_SNMP_OUT : MESSAGE_PKG.MESSAGE;
  LV_UDP_OUT : MESSAGE_PKG.MESSAGE;
  LV_BITS_OUT : BITS_PKG.BITS;
  EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
  EXCEPTION_ID: PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream reads.
  begin
    DS_FTP_OUT_NETWORK_INTERFACE_OUT_BUFFER.READ(LV_FTP_OUT);
  exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("FTP_OUT_NETWORK_INTERFACE_OUT", "NETWORK_INTERF
ACE_OUT");
  end;
end;

```



```

--OUT");
end;
begin
DS_SMTTP_OUT_NETWORK_INTERFACE_OUT.BUFFER.READ(LV_SMTTP_OUT);
exception
when BUFFER_UNDERFLOW =>
DS_DEBUG.BUFFER_UNDERFLOW("SMTTP_OUT_NETWORK_INTERFACE_OUT", "NETWORK_INTERFACE_OUT");
end;
begin
DS_SNNMP_OUT_NETWORK_INTERFACE_OUT.BUFFER.READ(LV_SNNMP_OUT);
exception
when BUFFER_UNDERFLOW =>
DS_DEBUG.BUFFER_UNDERFLOW("SNNMP_OUT_NETWORK_INTERFACE_OUT", "NETWORK_INTERFACE_OUT");
end;
begin
DS_UDP_OUT_NETWORK_INTERFACE_OUT.BUFFER.READ(LV_UDP_OUT);
exception
when BUFFER_UNDERFLOW =>
DS_DEBUG.BUFFER_UNDERFLOW("UDP_OUT_NETWORK_INTERFACE_OUT", "NETWORK_INTERFACE_OUT");
end;
end;

-- Execution trigger condition check.
if True then
begin
NETWORK_INTERFACE_OUT(
FTP_OUT => LV_FTP_OUT,
HTTP_OUT => LV_HTTP_OUT,
SMTTP_OUT => LV_SMTTP_OUT,
SNNMP_OUT => LV_SNNMP_OUT,
UDP_OUT => LV_UDP_OUT,
BITS_OUT => LV_BITS_OUT);
exception
when others =>
DS_DEBUG.UNDECLARED_EXCEPTION("NETWORK_INTERFACE_OUT");
EXCEPTION_HAS_OCCURRED := true;
EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;
else return;
end if;

-- Exception Constraint translations.

-- Other constraint option translations.

--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
begin
DS_BITS_OUT_NETWORK.BUFFER.WRITE(LV_BITS_OUT);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("BITS_OUT_NETWORK", "NETWORK_INTERFACE_OUT");
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
DS_DEBUG.UNHANDLED_EXCEPTION(
"NETWORK_INTERFACE_OUT",
PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end NETWORK_INTERFACE_OUT_DRIVER;

procedure SESSION_MANAGER_DRIVER is
LV_DATA_STR_IN : MESSAGE_PKG.MESSAGE;
LV_SESSION_DATA : MESSAGE_PKG.MESSAGE;
LV_FTP_IN : MESSAGE_PKG.MESSAGE;
LV_FTP_MSG_OUT : MESSAGE_PKG.MESSAGE;
LV_HTTP_IN : MESSAGE_PKG.MESSAGE;
LV_HTTP_MSG_OUT : MESSAGE_PKG.MESSAGE;
LV_SMTTP_IN : MESSAGE_PKG.MESSAGE;
LV_SMTTP_MSG_OUT : MESSAGE_PKG.MESSAGE;
LV_SNNMP_IN : MESSAGE_PKG.MESSAGE;
LV_SNNMP_MSG_OUT : MESSAGE_PKG.MESSAGE;
LV_UDP_IN : MESSAGE_PKG.MESSAGE;
LV_UDP_MSG_OUT : MESSAGE_PKG.MESSAGE;
LV_SESSION_CONTROL : MESSAGE_PKG.MESSAGE;

EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
EXCEPTION_ID : PSDL_EXCEPTION;
begin
-- Data trigger checks.

-- Data stream reads.
begin
DS_DATA_STR_IN_SESSION_MANAGER.BUFFER.READ(LV_DATA_STR_IN);
exception
when BUFFER_UNDERFLOW =>
DS_DEBUG.BUFFER_UNDERFLOW("DATA_STR_IN_SESSION_MANAGER", "SESSION_MANAGER");
end;
begin
DS_SESSION_CONTROL_SESSION_MANAGER.BUFFER.READ(LV_SESSION_CONTROL);
exception
when BUFFER_UNDERFLOW =>
DS_DEBUG.BUFFER_UNDERFLOW(
"SESSION_CONTROL_SESSION_MANAGER", "SESSION_MANAGER");
end;
begin
DS_SESSION_DATA_SESSION_MANAGER.BUFFER.READ(LV_SESSION_DATA);
exception
when BUFFER_UNDERFLOW =>
DS_DEBUG.BUFFER_UNDERFLOW("SESSION_DATA_SESSION_MANAGER", "SESSION_MANAGER");
end;

-- Execution trigger condition check.
if True then
begin
SESSION_MANAGER(
DATA_STR_IN => LV_DATA_STR_IN,
SESSION_DATA => LV_SESSION_DATA,
FTP_IN => LV_FTP_IN,
FTP_MSG_OUT => LV_FTP_MSG_OUT,
HTTP_IN => LV_HTTP_IN,
HTTP_MSG_OUT => LV_HTTP_MSG_OUT,
SMTTP_IN => LV_SMTTP_IN,
SMTTP_MSG_OUT => LV_SMTTP_MSG_OUT,
SNNMP_IN => LV_SNNMP_IN,
SNNMP_MSG_OUT => LV_SNNMP_MSG_OUT,
UDP_IN => LV_UDP_IN,
UDP_MSG_OUT => LV_UDP_MSG_OUT,
SESSION_CONTROL => LV_SESSION_CONTROL);
exception
when others =>
DS_DEBUG.UNDECLARED_EXCEPTION("SESSION_MANAGER");
EXCEPTION_HAS_OCCURRED := true;
EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;
else return;
end;

```

```

end if;

-- Exception Constraint translations.

-- Other constraint option translations.

-- Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_FTP_IN_FTP_PROCESSOR_IN.BUFFER.WRITE(LV_FTP_IN);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("FTP_IN_FTP_PROCESSOR_IN", "SESSION_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_FTP_MSG_OUT_FTP_PROCESSOR_OUT.BUFFER.WRITE(LV_FTP_MSG_OUT);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("FTP_MSG_OUT_FTP_PROCESSOR_OUT", "SESSION_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_HTTP_IN_HTTP_PROCESSOR_IN.BUFFER.WRITE(LV_HTTP_IN);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("HTTP_IN_HTTP_PROCESSOR_IN", "SESSION_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_HTTP_MSG_OUT_HTTP_PROCESSOR_OUT.BUFFER.WRITE(LV_HTTP_MSG_OUT);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("HTTP_MSG_OUT_HTTP_PROCESSOR_OUT", "SESSION_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_SMP_IN_SMP_PROCESSOR_IN.BUFFER.WRITE(LV_SMP_IN);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("SMP_IN_SMP_PROCESSOR_IN", "SESSION_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_SMP_MSG_OUT_SMP_PROCESSOR_OUT.BUFFER.WRITE(LV_SMP_MSG_OUT);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("SMP_MSG_OUT_SMP_PROCESSOR_OUT", "SESSION_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_SNMP_IN_SNMP_PROCESSOR_IN.BUFFER.WRITE(LV_SNMP_IN);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("SNMP_IN_SNMP_PROCESSOR_IN", "SESSION_MANAGER");
end;
end if;

begin
  DS_SNMP_MSG_OUT_SNMP_PROCESSOR_OUT.BUFFER.WRITE(LV_SNMP_MSG_OUT);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("SNMP_MSG_OUT_SNMP_PROCESSOR_OUT", "SESSION_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_UDP_IN_UDP_PROCESSOR_IN.BUFFER.WRITE(LV_UDP_IN);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("UDP_IN_UDP_PROCESSOR_IN", "SESSION_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_UDP_MSG_OUT_UDP_PROCESSOR_OUT.BUFFER.WRITE(LV_UDP_MSG_OUT);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("UDP_MSG_OUT_UDP_PROCESSOR_OUT", "SESSION_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
  DS_SESSION_CONTROL_SESSION_MANAGER.BUFFER.WRITE(LV_SESSION_CONTROL);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("SESSION_CONTROL_SESSION_MANAGER", "SESSION_MANAGER");
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "SESSION_MANAGER",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end SESSION_MANAGER_DRIVER;

procedure CORREL_HANDLE_QUERY_DRIVER is
  LV_CORREL_FILTER : TRACKS_PKG.TRACKS;
  LV_VALID_TRACKS : TRACKS_PKG.TRACKS;
  LV_RESPOND_VALID_TRACKS : TRACKS_PKG.TRACKS;
  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream tests.
begin
  DS_CORREL_FILTER := CORREL_FILTER;
exception
  when BUFFER_OVERFLOW then
    DS_DEBUG.BUFFER_OVERFLOW("CORREL_HANDLE_QUERY", "CORREL_HANDLE_QUERY");
end;
begin
  DS_VALID_TRACKS_CORREL_HANDLE_QUERY_BUFFER.READ(LV_VALID_TRACKS);
exception

```



```

end if;
end CORREL_UPDATE_FILTER_DRIVER;

procedure CORREL_UPDATE_TRACKS_DRIVER is
  LV_CS_DEL_TRACKS : TRACKS_PKG.TRACKS;
  LV_CORREL_TRACK_DB : TRACKS_PKG.TRACKS;

  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  begin
    -- Data stream reads.
    DS_CORREL_TRACK_DB_CORREL_UPDATE_TRACKS.BUFFER.READ(LV_CORREL_TRACK_DB);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("CORREL_TRACK_DB_CORREL_UPDATE_TRACKS", "CORREL_UPDA
TE_TRACKS");
  end;
  begin
    DS_CS_DEL_TRACKS_CORREL_UPDATE_TRACKS.BUFFER.READ(LV_CS_DEL_TRACKS);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("CS_DEL_TRACKS_CORREL_UPDATE_TRACKS", "CORREL_UPDATE
_TRACKS");
  end;

  -- Execution trigger condition check.
  if True then
    begin
      CORREL_UPDATE_TRACKS(
        CS_DEL_TRACKS => LV_CS_DEL_TRACKS,
        CORREL_TRACK_DB => LV_CORREL_TRACK_DB);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("CORREL_UPDATE_TRACKS");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
  end if;

  -- Exception Constraint translations.
  -- Other constraint option translations.

  -- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_CORREL_TRACK_DB_CORRELATE_TRACKS.BUFFER.WRITE(LV_CORREL_TRACK_DB);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("CORREL_TRACK_DB_CORRELATE_TRACKS", "CORREL_UPDATE_
TRACKS");
    end;
  begin
    DS_CORREL_TRACK_DB_CORREL_UPDATE_TRACKS.BUFFER.WRITE(LV_CORREL_TRACK_DB);
  exception
    when BUFFER_OVERFLOW =>
      DS_DEBUG.BUFFER_OVERFLOW("CORREL_TRACK_DB_CORREL_UPDATE_TRACKS", "CORREL_UPD
ATE_TRACKS");
    end;
  end if;
end if;

```

```

if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "CORREL_UPDATE_TRACKS",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end CORREL_UPDATE_TRACKS_DRIVER;

procedure CORRELATE_TRACKS_DRIVER is
  LV_CORREL_RECORD_DB : DB_RECORD_PKG.DB_RECORD;
  LV_CORREL_TRACK_DB : TRACKS_PKG.TRACKS;
  LV_VALID_TRACKS : TRACKS_PKG.TRACKS;

  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  begin
    -- Data stream reads.
    DS_CORREL_RECORD_DB_CORRELATE_TRACKS.BUFFER.READ(LV_CORREL_RECORD_DB);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("CORREL_RECORD_DB_CORRELATE_TRACKS", "CORRELATE_
TRACKS");
  end;
  begin
    DS_CORREL_TRACK_DB_CORRELATE_TRACKS.BUFFER.READ(LV_CORREL_TRACK_DB);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("CORREL_TRACK_DB_CORRELATE_TRACKS", "CORRELATE_T
RACKS");
  end;

  -- Execution trigger condition check.
  if True then
    begin
      CORRELATE_TRACKS(
        CORREL_RECORD_DB => LV_CORREL_RECORD_DB,
        CORREL_TRACK_DB => LV_CORREL_TRACK_DB,
        VALID_TRACKS => LV_VALID_TRACKS);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("CORRELATE_TRACKS");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
  end if;

  -- Exception Constraint translations.
  -- Other constraint option translations.

  -- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_VALID_TRACKS_CORREL_HANDLE_QUERY.BUFFER.WRITE(LV_VALID_TRACKS);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("VALID_TRACKS_CORREL_HANDLE_QUERY", "CORRELATE_
TRACKS");
    end;
  end;
end if;

```

```

DS_DEBUG.UNHANDLED_EXCEPTION(
    "CORRELATE_TRACKS",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end correlate_tracks_driver;

procedure UPDATE_TACTICAL_DB_DRIVER is
    LV_RESPOND_DB_CHANGE : DB_RECORD_PKG.DB_RECORD;
    LV_CORREL_RECORD_DB : DB_RECORD_PKG.DB_RECORD;

    EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
    EXCEPTION_ID: PSDL_EXCEPTION;
begin
    -- Data trigger checks.

    -- Data stream reads.
    begin
        DS_CORREL_RECORD_DB.UPDATE_TACTICAL_DB.BUFFER.READ(LV_CORREL_RECORD_DB);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("CORREL_RECORD_DB.UPDATE_TACTICAL_DB", "UPDATE_TACTI
CAL_DB");
    end;
begin
    DS_RESPOND_DB.CHANGE_UPDATE_TACTICAL_DB.BUFFER.READ(LV_RESPOND_DB_CHANGE);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("RESPOND_DB_CHANGE.UPDATE_TACTICAL_DB", "UPDATE_TACTI
CAL_DB");
    end;

    -- Execution trigger condition check.
    if True then
        begin
            UPDATE_TACTICAL_DB(
                RESPOND_DB_CHANGE => LV_RESPOND_DB_CHANGE,
                CORREL_RECORD_DB => LV_CORREL_RECORD_DB);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("UPDATE_TACTICAL_DB");
                EXCEPTION_HAS_OCCURRED := true;
                EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
            end;
        else return;
        end if;

    -- Exception Constraint translations.

    -- Other constraint option translations.

    -- Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_CORREL_RECORD_DB.CORRELATE_TRACKS.BUFFER.WRITE(LV_CORREL_RECORD_DB);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("CORREL_RECORD_DB.CORRELATE_TRACKS", "UPDATE_TACTIC
AL_DB");
            end;
        begin
            DS_CORREL_RECORD_DB.UPDATE_TACTICAL_DB.BUFFER.WRITE(LV_CORREL_RECORD_DB);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("CORREL_RECORD_DB.UPDATE_TACTICAL_DB", "UPDATE_TACTI
CAL_DB");
            end;
        end;
    end;

    -- PSDL Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "UPDATE_TACTICAL_DB",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
        end if;
    end UPDATE_TACTICAL_DB_DRIVER;

    procedure ADD_FILE_DRIVER is
        LV_REQ_ADD_FILE : DB_RECORD_PKG.DB_RECORD;
        LV_FILE_ADD_DB : DB_RECORD_PKG.DB_RECORD;

        EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
        EXCEPTION_ID: PSDL_EXCEPTION;
    begin
        -- Data trigger checks.

        -- Data stream reads.
        begin
            DS_FILE_ADD_DB.ADD_FILE.BUFFER.READ(LV_FILE_ADD_DB);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW("FILE_ADD_DB.ADD_FILE", "ADD_FILE");
            end;
        begin
            DS_REQ_ADD_FILE.ADD_FILE.BUFFER.READ(LV_REQ_ADD_FILE);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW("REQ_ADD_FILE.ADD_FILE",
"ADD_FILE");
            end;

    -- Execution trigger condition check.
    if True then
        begin
            ADD_FILE(
                REQ_ADD_FILE => LV_REQ_ADD_FILE,
                FILE_ADD_DB => LV_FILE_ADD_DB);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("ADD_FILE");
                EXCEPTION_HAS_OCCURRED := true;
                EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
            end;
        else return;
        end if;

    -- Exception Constraint translations.

    -- Other constraint option translations.

    -- Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_FILE_ADD_DB.ADD_FILE.BUFFER.WRITE(LV_FILE_ADD_DB);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("FILE_ADD_DB.ADD_FILE", "ADD_FILE");
            end;
        begin
            DS_FILE_ADD_DB.FORMAT_RESPONSE.BUFFER.WRITE(LV_FILE_ADD_DB);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("FILE_ADD_DB.FORMAT_RESPONSE", "ADD_FILE");
            end;
        end;
    end;
end;

```



```

-- DS_DEBUG.BUFFER_OVERFLOW("REQ_ADD_DB_FORMAT_RESPONSE", "ADD_RECORD");
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "ADD_RECORD",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end ADD_RECORD_DRIVER;

procedure DELETE_FILE_DRIVER is
  LV_REQ_DEL_FILE : DB.RECORD_PKG.DB.RECORD;
  LV_FILE_DEL_DB : DB.RECORD_PKG.DB.RECORD;

  EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
  EXCEPTION_ID: PSDL_EXCEPTION;
begin
  -- Data trigger checks.

  -- Data stream reads.
  begin
    DS_FILE_DEL_DB.DELETE_FILE.BUFFER.READ(LV_FILE_DEL_DB);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("FILE_DEL_DB_DELETE_FILE", "DELETE_FILE");
  end;
  begin
    DS_REQ_DEL_FILE.DELETE_FILE.BUFFER.READ(LV_REQ_DEL_FILE);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("REQ_DEL_FILE_DELETE_FILE", "DELETE_FILE");
  end;
  -- Execution trigger condition check.
  if True then
    begin
      DELETE_FILE(
        REQ_DEL_FILE => LV_REQ_DEL_FILE,
        FILE_DEL_DB => LV_FILE_DEL_DB);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("DELETE_FILE");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
    end if;

  -- Exception Constraint translations.

  -- Other constraint option translations.

  -- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_FILE_DEL_DB.DELETE_FILE.BUFFER.WRITE(LV_FILE_DEL_DB);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("FILE_DEL_DB_DELETE_FILE", "DELETE_FILE");
      end;
    begin
      DS_FILE_DEL_DB.FORMAT_RESPONSE.BUFFER.WRITE(LV_FILE_DEL_DB);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("FILE_DEL_DB_DELETE_FILE", "DELETE_FILE");
      end;
  end;

  -- DS_DEBUG.BUFFER_OVERFLOW("FILE_DEL_DB_DELETE_FILE", "DELETE_FILE");
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "DELETE_FILE",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end DELETE_FILE_DRIVER;

procedure DELETE_OBJECT_DRIVER is
  LV_REQ_DEL_OBJ : DB.RECORD_PKG.DB.RECORD;
  LV_OBJ_DEL_DB : DB.RECORD_PKG.DB.RECORD;

  EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
  EXCEPTION_ID: PSDL_EXCEPTION;
begin
  -- Data trigger checks.

  -- Data stream reads.
  begin
    DS_OBJ_DEL_DB.DELETE_OBJECT.BUFFER.READ(LV_OBJ_DEL_DB);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("OBJ_DEL_DB_DELETE_OBJECT",
        "DELETE_OBJECT");
  end;
  begin
    DS_REQ_DEL_OBJ.DELETE_OBJECT.BUFFER.READ(LV_REQ_DEL_OBJ);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("REQ_DEL_OBJ_DELETE_OBJECT", "DELETE_OBJECT");
  end;
  -- Execution trigger condition check.
  if True then
    begin
      DELETE_OBJECT(
        REQ_DEL_OBJ => LV_REQ_DEL_OBJ,
        OBJ_DEL_DB => LV_OBJ_DEL_DB);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("DELETE_OBJECT");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
    end if;

  -- Exception Constraint translations.

  -- Other constraint option translations.

  -- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_OBJ_DEL_DB.DELETE_OBJECT.BUFFER.WRITE(LV_OBJ_DEL_DB);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("OBJ_DEL_DB_DELETE_OBJECT", "DELETE_OBJECT");
      end;
    begin
      DS_OBJ_DEL_DB.FORMAT_RESPONSE.BUFFER.WRITE(LV_OBJ_DEL_DB);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("OBJ_DEL_DB_DELETE_OBJECT", "DELETE_OBJECT");
      end;
  end;

```

```

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG_BUFFER_OVERFLOW("OBJ_DEL_DB_FORMAT_RESPONSE", "DELETE_OBJECT");
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG_UNHANDLED_EXCEPTION(
        "DELETE_OBJECT",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end DELETE_OBJECT_DRIVER;

procedure DELETE_RECORD_DRIVER is
    lv_req_del_rec : DB_RECORD_PKG.DB_RECORD;
    lv_rec_del_db : DB_RECORD_PKG.DB_RECORD;
    EXCEPTION_HAS_OCCURRED := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.
    begin
        -- Data stream reads.
        begin
            DS_REC_DEL_DB_DELETE_RECORD.READ(lv_req_del_db);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG_BUFFER_UNDERFLOW("REQ_DEL_DB_DELETE_RECORD", "DELETE_RECORD");
        end;
        begin
            DS_REQ_DEL_REC_DELETE_RECORD.READ(lv_req_del_rec);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG_BUFFER_UNDERFLOW("REQ_DEL_REC_DELETE_RECORD", "DELETE_RECORD");
        end;
    end;
    -- Execution trigger condition check.
    if True then
        begin
            DELETE_RECORD(
                REQ_DEL_REC => lv_req_del_rec,
                REC_DEL_DB => lv_rec_del_db);
        exception
            when others =>
                DS_DEBUG_UNDECLARED_EXCEPTION("DELETE_RECORD");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
    else return;
    end if;

-- Exception Constraint translations.
-- Other constraint option translations.

--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
    begin
        DS_REC_DEL_DB_DELETE_RECORD.WRITE(lv_req_del_db);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG_BUFFER_OVERFLOW("REC_DEL_DB_DELETE_RECORD", "DELETE_RECORD");
    end;
    begin
        DS_REC_DEL_DB_FORMAT_RESPONSE.WRITE(lv_req_del_db);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG_BUFFER_OVERFLOW("FILE_ADD_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_OBJ_ADD_DB_FORMAT_RESPONSE.READ(lv_file_add_db);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("FILE_ADD_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_FILE_DEL_DB_FORMAT_RESPONSE.READ(lv_file_del_db);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("FILE_DEL_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_FILE_MOD_DB_FORMAT_RESPONSE.READ(lv_file_mod_db);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("FILE_MOD_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_FILE_RETR_MSG_FORMAT_RESPONSE.READ(lv_file_retr_msg);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("FILE_RETR_MSG_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_OBJ_ADD_DB_FORMAT_RESPONSE.READ(lv_obj_add_db);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("OBJ_ADD_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_OBJ_DEL_DB_FORMAT_RESPONSE.READ(lv_obj_del_db);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("OBJ_DEL_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_OBJ_MOD_DB_FORMAT_RESPONSE.READ(lv_obj_mod_db);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("OBJ_MOD_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_REC_ADD_DB_FORMAT_RESPONSE.READ(lv_rec_add_db);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("REC_ADD_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_REC_DEL_DB_FORMAT_RESPONSE.READ(lv_rec_del_db);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("REC_DEL_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_REC_MOD_DB_FORMAT_RESPONSE.READ(lv_rec_mod_db);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("REC_MOD_DB_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_REC_RETR_MSG_FORMAT_RESPONSE.READ(lv_rec_retr_msg);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("REC_RETR_MSG_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
    begin
        DS_RESPOND_MSG_FORMAT_RESPONSE.READ(lv_resp_msg);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG_BUFFER_UNDERFLOW("RESPOND_MSG_FORMAT_RESPONSE", "FORMAT_RESPONSE");
        end;
    end;
end;

```



```

end;
begin
  DS_OBJ_DEL_DB.FORMAT_RESPONSE.BUFFER.READ(LV_OBJ_DEL_DB);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("OBJ_DEL_DB.FORMAT_RESPONSE", "FORMAT_RESPONSE");
end;
begin
  DS_OBJ_MOD_DB.FORMAT_RESPONSE.BUFFER.READ(LV_OBJ_MOD_DB);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("OBJ_MOD_DB.FORMAT_RESPONSE", "FORMAT_RESPONSE");
end;
begin
  DS_OBJ_RETR_MSG.FORMAT_RESPONSE.BUFFER.READ(LV_OBJ_RETR_MSG);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("OBJ_RETR_MSG.FORMAT_RESPONSE", "FORMAT_RESPONSE");
end;
begin
  DS_OBJ_RETR_MSG.FORMAT_RESPONSE.BUFFER.READ(LV_OBJ_RETR_MSG);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("OBJ_RETR_MSG.FORMAT_RESPONSE", "FORMAT_RESPONSE");
end;
begin
  DS_REC_ADD_DB.FORMAT_RESPONSE.BUFFER.READ(LV_REC_ADD_DB);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("REC_ADD_DB.FORMAT_RESPONSE", "FORMAT_RESPONSE");
end;
begin
  DS_REC_DEL_DB.FORMAT_RESPONSE.BUFFER.READ(LV_REC_DEL_DB);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("REC_DEL_DB.FORMAT_RESPONSE", "FORMAT_RESPONSE");
end;
begin
  DS_REC_MOD_DB.FORMAT_RESPONSE.BUFFER.READ(LV_REC_MOD_DB);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("REC_MOD_DB.FORMAT_RESPONSE", "FORMAT_RESPONSE");
end;
begin
  DS_REC_RETR_MSG.FORMAT_RESPONSE.BUFFER.READ(LV_REC_RETR_MSG);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("REC_RETR_MSG.FORMAT_RESPONSE", "FORMAT_RESPONSE");
end;
end;

-- Execution trigger condition check.
if true then
  begin
    FORMAT_RESPONSE(
      FILE_ADD_DB => LV_FILE_ADD_DB,
      FILE_DEL_DB => LV_FILE_DEL_DB,
      FILE_MOD_DB => LV_FILE_MOD_DB,
      FILE_RETR_MSG => LV_FILE_RETR_MSG,
      OBJ_ADD_DB => LV_OBJ_ADD_DB,
      OBJ_DEL_DB => LV_OBJ_DEL_DB,
      OBJ_MOD_DB => LV_OBJ_MOD_DB,
      OBJ_RETR_MSG => LV_OBJ_RETR_MSG,
      REC_ADD_DB => LV_REC_ADD_DB,
      REC_DEL_DB => LV_REC_DEL_DB,
      REC_MOD_DB => LV_REC_MOD_DB,
      REC_RETR_MSG => LV_REC_RETR_MSG,
      RESPOND_MSG => LV_RESPOND_MSG);
  exception
    when others =>
      DS_DEBUG.UNDECLARED_EXCEPTION("FORMAT_RESPONSE");
      EXCEPTION_HAS_OCCURRED := true;
      EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
  end;
end;

end;
else return;
end if;

-- Exception constraint translations.
-- Other constraint option translations.
-- Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
  begin
    DS_RESPOND_MSG.SERVER.THREAD_MANAGER.BUFFER.WRITE(LV_RESPOND_MSG);
  exception
    when BUFFER_OVERFLOW =>
      DS_DEBUG.BUFFER_OVERFLOW("RESPOND_MSG.SERVER.THREAD_MANAGER", "FORMAT_RESPONSE");
  end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "FORMAT_RESPONSE",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
  end if;
end FORMAT_RESPONSE_DRIVER;

procedure MOD_FILE_DRIVER is
  LV_REQ_MOD_FILE : DB_RECORD_PKG.DB_RECORD;
  LV_FILE_MOD_DB : DB_RECORD_PKG.DB_RECORD;
begin
  EXCEPTION_HAS_OCCURRED := FALSE;
  EXCEPTION_ID := PSDL_EXCEPTION;
  begin
    -- Data trigger checks.
    -- Data stream reads.
    begin
      DS_FILE_MOD_DB.MOD_FILE.BUFFER.READ(LV_FILE_MOD_DB);
    exception
      when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("FILE_MOD_DB.MOD_FILE", "MOD_FILE");
    end;
    begin
      DS_REQ_MOD_FILE.MOD_FILE.BUFFER.READ(LV_REQ_MOD_FILE);
    exception
      when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("REQ_MOD_FILE.MOD_FILE", "MOD_FILE");
    end;
  end;
end;

-- Execution trigger condition check.
if true then
  begin
    MOD_FILE(
      REQ_MOD_FILE => LV_REQ_MOD_FILE,
      FILE_MOD_DB => LV_FILE_MOD_DB);
  exception
    when others =>
      DS_DEBUG.UNDECLARED_EXCEPTION("MOD_FILE");
      EXCEPTION_HAS_OCCURRED := true;
      EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
  end;
else return;
end if;

-- Exception constraint translations.

```

-- Other constraint option translations.

--Unconditional output translations.

if not EXCEPTION\_HAS\_OCCURRED then

begin

DS\_FILE\_MOD\_DB.MOD\_FILE.BUFFER.WRITE(LV\_FILE\_MOD\_DB);

exception

when BUFFER\_OVERFLOW =>

DS\_DEBUG.BUFFER\_OVERFLOW("FILE\_MOD\_DB.MOD\_FILE", "MOD\_FILE");

end;

begin

DS\_FILE\_MOD\_DB.FORMAT\_RESPONSE.BUFFER.WRITE(LV\_FILE\_MOD\_DB);

exception

when BUFFER\_OVERFLOW =>

DS\_DEBUG.BUFFER\_OVERFLOW("FILE\_MOD\_DB.FORMAT\_RESPONSE", "MOD\_FILE");

end;

end if;

-- PSDL Exception handler.

if EXCEPTION\_HAS\_OCCURRED then

DS\_DEBUG.UNHANDLED\_EXCEPTION(

"MOD\_FILE",

PSDL\_EXCEPTION\_IMAGE(EXCEPTION\_ID));

end if;

end MOD\_FILE\_DRIVER;

procedure MOD\_OBJECT\_DRIVER is

LV\_REQ\_MOD\_OBJ : DB\_RECORD\_PKG.DB\_RECORD;

LV\_OBJ\_MOD\_DB : DB\_RECORD\_PKG.DB\_RECORD;

EXCEPTION\_HAS\_OCCURRED: BOOLEAN := FALSE;

EXCEPTION\_ID: PSDL\_EXCEPTION;

begin

-- Data trigger checks.

-- Data stream reads.

begin

DS\_OBJ\_MOD\_DB.MOD\_OBJECT.BUFFER.READ(LV\_OBJ\_MOD\_DB);

exception

when BUFFER\_UNDERFLOW =>

DS\_DEBUG.BUFFER\_UNDERFLOW("OBJ\_MOD\_DB.MOD\_OBJECT", "MOD\_OBJECT");

end;

begin

DS\_REQ\_MOD\_OBJ.MOD\_OBJECT.BUFFER.READ(LV\_REQ\_MOD\_OBJ);

exception

when BUFFER\_UNDERFLOW =>

DS\_DEBUG.BUFFER\_UNDERFLOW("REQ\_MOD\_OBJ.MOD\_OBJECT", "MOD\_OBJECT");

end;

-- Execution trigger condition check.

if True then

begin

MOD\_OBJECT(

REQ\_MOD\_OBJ => LV\_REQ\_MOD\_OBJ,

OBJ\_MOD\_DB => LV\_OBJ\_MOD\_DB);

exception

when others =>

DS\_DEBUG.UNDECLARED\_EXCEPTION("MOD\_OBJECT");

EXCEPTION\_HAS\_OCCURRED := true;

EXCEPTION\_ID := UNDECLARED\_ADA\_EXCEPTION;

end;

else return;

end if;

end if;

-- Other constraint option translations.

--Unconditional output translations.

if not EXCEPTION\_HAS\_OCCURRED then

begin

DS\_OBJ\_MOD\_DB.FORMAT\_RESPONSE.BUFFER.WRITE(LV\_OBJ\_MOD\_DB);

exception

when BUFFER\_OVERFLOW =>

DS\_DEBUG.BUFFER\_OVERFLOW("OBJ\_MOD\_DB.FORMAT\_RESPONSE", "MOD\_OBJECT");

end;

begin

DS\_OBJ\_MOD\_DB.MOD\_OBJECT.BUFFER.WRITE(LV\_OBJ\_MOD\_DB);

exception

when BUFFER\_OVERFLOW =>

DS\_DEBUG.BUFFER\_OVERFLOW("OBJ\_MOD\_DB.MOD\_OBJECT", "MOD\_OBJECT");

end;

end if;

-- PSDL Exception handler.

if EXCEPTION\_HAS\_OCCURRED then

DS\_DEBUG.UNHANDLED\_EXCEPTION(

"MOD\_OBJECT",

PSDL\_EXCEPTION\_IMAGE(EXCEPTION\_ID));

end if;

end MOD\_OBJECT\_DRIVER;

procedure MOD\_RECORD\_DRIVER is

LV\_REQ\_MOD\_REC : DB\_RECORD\_PKG.DB\_RECORD;

LV\_REC\_MOD\_DB : DB\_RECORD\_PKG.DB\_RECORD;

EXCEPTION\_HAS\_OCCURRED: BOOLEAN := FALSE;

EXCEPTION\_ID: PSDL\_EXCEPTION;

begin

-- Data trigger checks.

-- Data stream reads.

begin

DS\_REC\_MOD\_DB.MOD\_RECORD.BUFFER.READ(LV\_REC\_MOD\_DB);

exception

when BUFFER\_UNDERFLOW =>

DS\_DEBUG.BUFFER\_UNDERFLOW("REC\_MOD\_DB.MOD\_RECORD", "MOD\_RECORD");

end;

begin

DS\_REQ\_MOD\_REC.MOD\_RECORD.BUFFER.READ(LV\_REQ\_MOD\_REC);

exception

when BUFFER\_UNDERFLOW =>

DS\_DEBUG.BUFFER\_UNDERFLOW("REQ\_MOD\_REC.MOD\_RECORD", "MOD\_RECORD");

end;

-- Execution trigger condition check.

if True then

begin

MOD\_RECORD(

REQ\_MOD\_REC => LV\_REQ\_MOD\_REC,

REC\_MOD\_DB => LV\_REC\_MOD\_DB);

exception

when others =>

DS\_DEBUG.UNDECLARED\_EXCEPTION("MOD\_RECORD");

EXCEPTION\_HAS\_OCCURRED := true;

EXCEPTION\_ID := UNDECLARED\_ADA\_EXCEPTION;

end;

else return;

end if;

end if;

```

-- Other constraint option translations.

--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
  begin
    DS_REC_MOD.DB_MOD_RECORD.BUFFER.WRITE(LV_REC_MOD.DB);
  exception
    when BUFFER_OVERFLOW =>
      DS_DEBUG.BUFFER_OVERFLOW("REC_MOD_DB_MOD_RECORD", "MOD_RECORD");
  end;
  begin
    DS_REC_MOD.DB_FORMAT_RESPONSE.BUFFER.WRITE(LV_REC_MOD.DB);
  exception
    when BUFFER_OVERFLOW =>
      DS_DEBUG.BUFFER_OVERFLOW("REC_MOD_DB_FORMAT_RESPONSE", "MOD_RECORD");
  end if;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "MOD_RECORD",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end MOD_RECORD_DRIVER;

procedure RESOLVE_DATA_TYPE_DRIVER is
  LV_REQ_DATA : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_DATA : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_DATA_TYPE : DB_RECORD_PKG.DB_RECORD;

  EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
  EXCEPTION_ID: PSDL_EXCEPTION;
begin
  -- Data trigger checks.

  -- Data stream reads.
  begin
    DS_REQ_DATA.RESOLVE_DATA_TYPE.BUFFER.READ(LV_REQ_DATA);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("REQ_DATA_RESOLVE_DATA_TYPE", "RESOLVE_DATA_TYPE");
  end;

  -- Execution trigger condition check.
  if True then
    begin
      RESOLVE_DATA_TYPE(
        REQ_DATA => LV_REQ_DATA,
        REQ_DATA_TYPE => LV_REQ_DATA_TYPE);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("RESOLVE_DATA_TYPE");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
  end if;

  -- Exception Constraint translations.

  -- Other constraint option translations.

--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
  begin
    DS_REQ_DATA_TYPE.RESOLVE_REQUEST_TYPE.BUFFER.WRITE(LV_REQ_DATA_TYPE);
  exception
    when BUFFER_OVERFLOW =>
      DS_DEBUG.BUFFER_OVERFLOW("REQ_DATA_TYPE_RESOLVE_REQUEST_TYPE", "RESOLVE_DATA_TYPE");
  end;
  end if;

  -- PSDL Exception handler.
  if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
      "RESOLVE_DATA_TYPE",
      PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
  end if;
end RESOLVE_DATA_TYPE_DRIVER;

procedure RESOLVE_REQUEST_TYPE_DRIVER is
  LV_REQ_DATA_TYPE : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_ADD_FILE : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_ADD_OBJ : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_ADD_REC : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_DEL_FILE : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_DEL_OBJ : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_DEL_REC : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_MOD_FILE : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_MOD_OBJ : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_MOD_REC : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_RETR_FILE : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_RETR_OBJ : DB_RECORD_PKG.DB_RECORD;
  LV_REQ_RETR_REC : DB_RECORD_PKG.DB_RECORD;

  EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
  EXCEPTION_ID: PSDL_EXCEPTION;
begin
  -- Data trigger checks.

  -- Data stream reads.
  begin
    DS_REQ_DATA_TYPE.RESOLVE_REQUEST_TYPE.BUFFER.READ(LV_REQ_DATA_TYPE);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("REQ_DATA_TYPE_RESOLVE_REQUEST_TYPE", "RESOLVE_REQUEST_TYPE");
  end;

  -- Execution trigger condition check.
  if True then
    begin
      RESOLVE_REQUEST_TYPE(
        REQ_DATA_TYPE => LV_REQ_DATA_TYPE,
        REQ_ADD_FILE => LV_REQ_ADD_FILE,
        REQ_ADD_OBJ => LV_REQ_ADD_OBJ,
        REQ_ADD_REC => LV_REQ_ADD_REC,
        REQ_DEL_FILE => LV_REQ_DEL_FILE,
        REQ_DEL_OBJ => LV_REQ_DEL_OBJ,
        REQ_DEL_REC => LV_REQ_DEL_REC,
        REQ_MOD_FILE => LV_REQ_MOD_FILE,
        REQ_MOD_OBJ => LV_REQ_MOD_OBJ,
        REQ_MOD_REC => LV_REQ_MOD_REC,
        REQ_RETR_FILE => LV_REQ_RETR_FILE,
        REQ_RETR_OBJ => LV_REQ_RETR_OBJ,
        REQ_RETR_REC => LV_REQ_RETR_REC);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("RESOLVE_REQUEST_TYPE");
        EXCEPTION_HAS_OCCURRED := true;
    end;
  end if;
end;

```

```

EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;
else return;
end if;

-- Exception Constraint translations.

-- Other constraint option translations.

-- Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_ADD_FILE_ADD_FILE.BUFFER.WRITE(LV_REQ_ADD_FILE);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_ADD_FILE_ADD_FILE", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_ADD_OBJ_ADD_OBJECT.BUFFER.WRITE(LV_REQ_ADD_OBJ);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_ADD_OBJ_ADD_OBJECT", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_ADD_REC_ADD_RECORD.BUFFER.WRITE(LV_REQ_ADD_REC);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_ADD_REC_ADD_RECORD", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_DEL_FILE_DELETE_FILE.BUFFER.WRITE(LV_REQ_DEL_FILE);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_DEL_FILE_DELETE_FILE", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_DEL_OBJ_DELETE_OBJECT.BUFFER.WRITE(LV_REQ_DEL_OBJ);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_DEL_OBJ_DELETE_OBJECT", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_DEL_REC_DELETE_RECORD.BUFFER.WRITE(LV_REQ_DEL_REC);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_DEL_REC_DELETE_RECORD", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_MOD_FILE_MOD_FILE.BUFFER.WRITE(LV_REQ_MOD_FILE);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_MOD_FILE_MOD_FILE", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_MOD_OBJ_MOD_OBJECT.BUFFER.WRITE(LV_REQ_MOD_OBJ);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_MOD_OBJ_MOD_OBJECT", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_MOD_REC_MOD_RECORD.BUFFER.WRITE(LV_REQ_MOD_REC);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_MOD_REC_MOD_RECORD", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_RETR_FILE_RETRIEVE_FILE.BUFFER.WRITE(LV_REQ_RETR_FILE);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_RETR_FILE_RETRIEVE_FILE", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_RETR_OBJ_RETRIEVE_OBJECT.BUFFER.WRITE(LV_REQ_RETR_OBJ);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_RETR_OBJ_RETRIEVE_OBJECT", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_RETR_REC_RETRIEVE_RECORD.BUFFER.WRITE(LV_REQ_RETR_REC);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_RETR_REC_RETRIEVE_RECORD", "RESOLVE_REQUEST_TYPE");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_UNHANDLED_EXCEPTION("RESOLVE_REQUEST_TYPE",
PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end resolve_request_type_driver;

procedure retrieve_file_driver is
LV_REQ_RETR_FILE : DB_RECORD_PKG.DB_RECORD;
LV_FILE_RETR_MSG : DB_RECORD_PKG.DB_RECORD;
EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
EXCEPTION_ID : PSDL_EXCEPTION;
begin
-- Data trigger checks.

```

```

begin
  DS_REQ_RETR_FILE.RETRIEVE_FILE.BUFFER.READ(LV_REQ_RETR_FILE);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("REQ_RETR_FILE.RETRIEVE_FILE", "RETRIEVE_FILE");
end;

-- Execution trigger condition check.
if True then
  begin
    RETRIEVE_FILE(
      REQ_RETR_FILE => LV_REQ_RETR_FILE,
      FILE_RETR_MSG => LV_FILE_RETR_MSG);
  exception
    when others =>
      DS_DEBUG.UNDECLARED_EXCEPTION("RETRIEVE_FILE");
      EXCEPTION_HAS_OCCURRED := true;
      EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
    end;
  else return;
  end if;

-- Exception Constraint translations.
-- Other constraint option translations.
-- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_FILE_RETR_MSG.FORMAT_RESPONSE.BUFFER.WRITE(LV_FILE_RETR_MSG);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("FILE_RETR_MSG.FORMAT_RESPONSE", "RETRIEVE_FILE");
      end;
    end if;

-- PSDL Exception handler.
  if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
      "RETRIEVE_FILE",
      PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
  end RETRIEVE_FILE_DRIVER;

procedure RETRIEVE_OBJECT_DRIVER is
  LV_REQ_RETR_OBJ : DB_RECORD.PKG.DB_RECORD;
  LV_OBJ_RETR_MSG : DB_RECORD.PKG.DB_RECORD;
  EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
  EXCEPTION_ID: PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream reads.
  begin
    DS_REQ_RETR_OBJ.RETRIEVE_OBJECT.BUFFER.READ(LV_REQ_RETR_OBJ);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("REQ_RETR_OBJ.RETRIEVE_OBJECT", "RETRIEVE_OBJECT");
    end;
  -- Execution trigger condition check.
  if True then
    begin
      RETRIEVE_OBJECT(
        REQ_RETR_OBJ => LV_REQ_RETR_OBJ,
        OBJ_RETR_MSG => LV_OBJ_RETR_MSG);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("RETRIEVE_OBJECT");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
    end if;

    OBJ_RETR_MSG => LV_OBJ_RETR_MSG;
  exception
    when others =>
      DS_DEBUG.UNDECLARED_EXCEPTION("RETRIEVE_OBJECT");
      EXCEPTION_HAS_OCCURRED := true;
      EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
    end;
  else return;
  end if;

  T");
end;
end if;

-- PSDL Exception handler.
  if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
      "RETRIEVE_OBJECT",
      PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
  end RETRIEVE_OBJECT_DRIVER;

procedure RETRIEVE_RECORD_DRIVER is
  LV_REQ_RETR_REC : DB_RECORD.PKG.DB_RECORD;
  LV_REC_RETR_MSG : DB_RECORD.PKG.DB_RECORD;
  EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
  EXCEPTION_ID: PSDL_EXCEPTION;
begin
  -- Data trigger checks.
  -- Data stream reads.
  begin
    DS_REQ_RETR_REC.RETRIEVE_RECORD.BUFFER.READ(LV_REQ_RETR_REC);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("REQ_RETR_REC.RETRIEVE_RECORD", "RETRIEVE_RECORD");
    end;
  -- Execution trigger condition check.
  if True then
    begin
      RETRIEVE_RECORD(
        REQ_RETR_REC => LV_REQ_RETR_REC,
        REC_RETR_MSG => LV_REC_RETR_MSG);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("RETRIEVE_RECORD");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
    end if;
  end;
end if;

```

```
-- Exception Constraint translations.
-- Other constraint option translations.
--Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_REC_RETR_MSG_FORMAT_RESPONSE.BUFFER.WRITE(LV_REC_RETR_MSG);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("REC_RETR_MSG_FORMAT_RESPONSE", "RETRIEVE_RECORD");
        end if;
    end;

-- PSDL Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "RETRIEVE_RECORD",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
        end if;
    end RETRIEVE_RECORD_DRIVER;

procedure MOUNT_DEVICE_DRIVER is
    LV_ADMINISTER_DEVICE : DEVICE_PKG.DEVICE;
    LV_DEVICE_STATUS : BOOLEAN;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.

    -- Data stream reads.
    begin
        DS_ADMINISTER_DEVICE_MOUNT_DEVICE.BUFFER.READ(LV_ADMINISTER_DEVICE);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("ADMINISTER_DEVICE_MOUNT_DEVICE", "MOUNT_DEVICE");
        end;
    begin
        DS_DEVICE_STATUS_MOUNT_DEVICE.BUFFER.READ(LV_DEVICE_STATUS);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("DEVICE_STATUS_MOUNT_DEVICE", "MOUNT_DEVICE");
        end;

    -- Execution trigger condition check.
    if True then
        begin
            MOUNT_DEVICE(
                ADMINISTER_DEVICE => LV_ADMINISTER_DEVICE,
                DEVICE_STATUS => LV_DEVICE_STATUS);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("MOUNT_DEVICE");
                EXCEPTION_HAS_OCCURRED := true;
                EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
            end;
        else return;
        end if;

    -- Exception Constraint translations.
    -- Other constraint option translations.

--Unconditional output translations.
    begin
        DS_DELIVER_MAP_SERVER_THREAD_MANAGER.BUFFER.WRITE(LV_DEVICE_STATUS);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("DEVICE_STATUS_SERVER_THREAD_MANAGER", "MOUNT_D
EVICE");
        end;
    begin
        DS_DEVICE_STATUS_MOUNT_DEVICE.BUFFER.WRITE(LV_DEVICE_STATUS);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("DEVICE_STATUS_MOUNT_DEVICE", "MOUNT_DEVICE");
        end;
    end if;

-- PSDL Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "MOUNT_DEVICE",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
        end if;
    end MOUNT_DEVICE_DRIVER;

procedure LOCATE_MAP_DRIVER is
    LV_REQUEST_MAP : MAP;
    LV_DELIVER_MAP : MAP;

    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.

    -- Data stream reads.
    begin
        DS_REQUEST_MAP_LOCATE_MAP.BUFFER.READ(LV_REQUEST_MAP);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("REQUEST_MAP_LOCATE_MAP", "LOCATE_MAP");
        end;
    end;

    -- Execution trigger condition check.
    if True then
        begin
            LOCATE_MAP(
                REQUEST_MAP => LV_REQUEST_MAP,
                DELIVER_MAP => LV_DELIVER_MAP);
        exception
            when others =>
                DS_DEBUG.UNDECLARED_EXCEPTION("LOCATE_MAP");
                EXCEPTION_HAS_OCCURRED := true;
                EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
            end;
        else return;
        end if;

    -- Exception Constraint translations.
    -- Other constraint option translations.

--Unconditional output translations.
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_DELIVER_MAP_SERVER_THREAD_MANAGER.BUFFER.WRITE(LV_DELIVER_MAP);
        exception
```

```

P");
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "LOCATE_MAP",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end LOCATE_MAP_DRIVER;

procedure ARCHIVE_MSGS_DRIVER is
    LV_FEED_MSGS : MESSAGE_PKG.MESSAGE;
    LV_MSG_MESSAGE_DB : MESSAGE_PKG.MESSAGE;
    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.
begin
    -- Data stream reads.
begin
        DS_FEED_MSGS.ARCHIVE_MSGS_BUFFER.READ(LV_FEED_MSGS);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("FEED_MSGS.ARCHIVE_MSGS", "ARCHIVE_MSGS");
    end;
begin
        DS_MSG_MESSAGE_DB.ARCHIVE_MSGS_BUFFER.READ(LV_MSG_MESSAGE_DB);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("MSG_MESSAGE_DB.ARCHIVE_MSGS", "ARCHIVE_MSGS");
    end;
end;

-- Execution trigger condition check.
if True then
    begin
        ARCHIVE_MSGS(
            FEED_MSGS => LV_FEED_MSGS,
            MSG_MESSAGE_DB => LV_MSG_MESSAGE_DB);
    exception
        when others =>
            DS_DEBUG.UNDECLARED_EXCEPTION("ARCHIVE_MSGS");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
    else return;
    end if;
end;

-- Exception Constraint translations.
-- Other constraint option translations.

--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
    begin
        DS_MSG_MESSAGE_DB.ARCHIVE_MSGS_BUFFER.WRITE(LV_MSG_MESSAGE_DB);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("MSG_MESSAGE_DB.ARCHIVE_MSGS", "ARCHIVE_MSGS");
    end;
begin
    DS_MSG_MESSAGE_DB_MSG_HANDLE_QUERY_BUFFER.WRITE(LV_MSG_MESSAGE_DB);
exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("MSG_MESSAGE_DB_MSG_HANDLE_QUERY", "ARCHIVE_MSG

```

```

S");
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "ARCHIVE_MSGS",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end ARCHIVE_MSGS_DRIVER;

procedure MSG_HANDLE_QUERY_DRIVER is
    LV_MSG_FILTER : MESSAGE_PKG.MESSAGE;
    LV_MSG_MESSAGE_DB : MESSAGE_PKG.MESSAGE;
    LV_RESPOND_MSGS : MESSAGE_PKG.MESSAGE;
    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.
begin
    -- Data stream reads.
begin
        DS_MSG_FILTER.MSG_HANDLE_QUERY_BUFFER.READ(LV_MSG_FILTER);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("MSG_FILTER.MSG_HANDLE_QUERY", "MSG_HANDLE_QUERY
");
    end;
begin
        DS_MSG_MESSAGE_DB_MSG_HANDLE_QUERY_BUFFER.READ(
            LV_MSG_MESSAGE_DB);
    exception
        when BUFFER_UNDERFLOW =>
            DS_DEBUG.BUFFER_UNDERFLOW("MSG_MESSAGE_DB_MSG_HANDLE_QUERY", "MSG_HANDLE_Q
        UERY");
    end;
end;

-- Execution trigger condition check.
if True then
    begin
        MSG_HANDLE_QUERY(
            MSG_FILTER => LV_MSG_FILTER,
            MSG_MESSAGE_DB => LV_MSG_MESSAGE_DB,
            RESPOND_MSGS => LV_RESPOND_MSGS);
    exception
        when others =>
            DS_DEBUG.UNDECLARED_EXCEPTION("MSG_HANDLE_QUERY");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
    else return;
    end if;
end;

-- Exception Constraint translations.
-- Other constraint option translations.

--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
    begin
        DS_RESPOND_MSGS_SERVER_THREAD_MANAGER_BUFFER.WRITE(LV_RESPOND_MSGS);
    exception
        when BUFFER_OVERFLOW =>
            DS_DEBUG.BUFFER_OVERFLOW("RESPOND_MSGS_SERVER_THREAD_MANAGER", "MSG_HAND

```





```

if EXCEPTION_HAS_OCCURRED then
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("RESOURCE_PHYS_LOC_SERVER_THREAD_MANAGER", "RES
OLVE_RESOURCE_LOC");
end;
end if;
end TEMPLATE_DATABASE_DRIVER;

procedure RESOLVE_RESOURCE_LOC_DRIVER is
LV_REQ_RESOURCE : MESSAGE_PKG.MESSAGE;
LV_MOD_OBJ_LOC : ADMINISTER_PKG.ADMINISTER;
LV_RESOURCE_PHYS_LOC : MESSAGE_PKG.MESSAGE;
EXCEPTION_HAS_OCCURRED: BOOLEAN := FALSE;
EXCEPTION_ID: PSDL_EXCEPTION;
begin
-- Data trigger checks.

-- Data stream reads.
begin
DS_MOD_OBJ_LOC.RESOLVE_RESOURCE_LOC.BUFFER.READ(LV_MOD_OBJ_LOC);
exception
when BUFFER_UNDERFLOW =>
DS_DEBUG.BUFFER_UNDERFLOW("MOD_OBJ_LOC_RESOLVE_RESOURCE_LOC", "RESOLVE_RESOURC
E_LOC");
end;
begin
DS_REQ_RESOURCE.RESOLVE_RESOURCE_LOC.BUFFER.READ(LV_REQ_RESOURCE);
exception
when BUFFER_UNDERFLOW =>
DS_DEBUG.BUFFER_UNDERFLOW("REQ_RESOURCE_RESOLVE_RESOURCE_LOC", "RESOLVE_RESOUR
CE_LOC");
end;

-- Execution trigger condition check.
if True then
begin
RESOLVE_RESOURCE_LOC(
REQ_RESOURCE => LV_REQ_RESOURCE,
MOD_OBJ_LOC => LV_MOD_OBJ_LOC,
RESOURCE_PHYS_LOC => LV_RESOURCE_PHYS_LOC);
exception
when others =>
DS_DEBUG.UNDECLARED_EXCEPTION("RESOLVE_RESOURCE_LOC");
EXCEPTION_HAS_OCCURRED := true;
EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;
else return;
end if;

-- Exception Constraint translations.

-- Other constraint option translations.

-- Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
begin
DS_MOD_OBJ_LOC.RESOLVE_RESOURCE_LOC.BUFFER.WRITE(LV_MOD_OBJ_LOC);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("MOD_OBJ_LOC_RESOLVE_RESOURCE_LOC", "RESOLVE_RESOUR
CE_LOC");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_RESOURCE_PHYS_LOC_SERVER_THREAD_MANAGER.BUFFER.WRITE(LV_RESOURCE_PHYS_LOC);
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
DS_DEBUG.UNHANDLED_EXCEPTION(
"RESOLVE_RESOURCE_LOC",
PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end if;

exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("RESOURCE_PHYS_LOC_SERVER_THREAD_MANAGER", "RES
OLVE_RESOURCE_LOC");
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
DS_DEBUG.UNHANDLED_EXCEPTION(
"BUILD_FILE",
PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end;
end if;

-- Execution trigger condition check.
if True then
begin
BUILD_FILE(
SCREEN_PARAM => LV_SCREEN_PARAM,
FILE_NAME => LV_FILE_NAME);
exception
when others =>
DS_DEBUG.UNDECLARED_EXCEPTION("BUILD_FILE");
EXCEPTION_HAS_OCCURRED := true;
EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;
else return;
end if;

-- Exception Constraint translations.

-- Other constraint option translations.

-- Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
begin
DS_FILE_NAME : 1000;
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("FILE_NAME", "BUILD_FILE");
end;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
DS_DEBUG.UNHANDLED_EXCEPTION(
"BUILD_FILE",
PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end;
end if;

```



```

begin
  DS_JOB_SPOOLLED_MSG_SERVER_THREAD_MANAGER.BUFFER.WRITE(LV_JOB_SPOOLLED_MSG);
exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("JOB_SPOOLLED_MSG_SERVER_THREAD_MANAGER", "SPOOL_FILE"
    end;
  end if;
end;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "SPOOL_FILE",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
  end if;
end SPOOL_FILE_DRIVER;

procedure VALIDATE_CERTIFICATE_DRIVER is
  LV_REQUEST_CERTIFICATE : CERTIFICATE_PKG.CERTIFICATE;
  LV_ISSUE_CERTIFICATE : CERTIFICATE_PKG.CERTIFICATE;
  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  Data trigger checks.

  -- Data stream reads.
  begin
    DS_ISSUE_CERTIFICATE.VALIDATE_CERTIFICATE.BUFFER.READ(LV_ISSUE_CERTIFICATE);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("ISSUE_CERTIFICATE_VALIDATE_CERTIFICATE", "VALIDATE_CERTIFICATE");
    end;
  end;
  begin
    DS_REQUEST_CERTIFICATE.VALIDATE_CERTIFICATE.BUFFER.READ(LV_REQUEST_CERTIFICATE);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("REQUEST_CERTIFICATE_VALIDATE_CERTIFICATE", "VALIDATE_CERTIFICATE");
    end;
  end;

  -- Execution trigger condition check.
  if true then
    begin
      VALIDATE_CERTIFICATE(
        REQUEST_CERTIFICATE => LV_REQUEST_CERTIFICATE,
        ISSUE_CERTIFICATE => LV_ISSUE_CERTIFICATE);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("VALIDATE_CERTIFICATE");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
    end if;
  end;

  -- Exception Constraint translations.

  -- Other constraint option translations.

  -- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then
    begin
      DS_ISSUE_CERTIFICATE_SERVER_THREAD_MANAGER.BUFFER.WRITE(LV_ISSUE_CERTIFICATE);
    exception
      when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("ISSUE_CERTIFICATE_SERVER_THREAD_MANAGER", "VALIDATE_CERTIFICATE");
      end;
    end;
    begin
      DS_ISSUE_CERTIFICATE_VALIDATE_CERTIFICATE.BUFFER.WRITE(LV_ISSUE_CERTIFICATE_VALIDATE_CERTIFICATE");
    end;
  end if;
end;

exception
  when BUFFER_OVERFLOW =>
    DS_DEBUG.BUFFER_OVERFLOW("ISSUE_CERTIFICATE_SERVER_THREAD_MANAGER", "VALIDATE_CERTIFICATE");
  end;
  begin
    DS_ISSUE_CERTIFICATE_VALIDATE_CERTIFICATE.BUFFER.WRITE(LV_ISSUE_CERTIFICATE_VALIDATE_CERTIFICATE");
  end;
end;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
  DS_DEBUG.UNHANDLED_EXCEPTION(
    "VALIDATE_CERTIFICATE",
    PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
  end if;
end VALIDATE_CERTIFICATE_DRIVER;

procedure VALIDATE_KEY_DRIVER is
  LV_REQUEST_KEY : KEY_PKG.KEY;
  LV_ISSUE_KEY : KEY_PKG.KEY;
  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;
begin
  Data trigger checks.

  -- Data stream reads.
  begin
    DS_ISSUE_KEY_VALIDATE_KEY.BUFFER.READ(LV_ISSUE_KEY);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("ISSUE_KEY_VALIDATE_KEY", "VALIDATE_KEY");
    end;
  end;
  begin
    DS_REQUEST_KEY_VALIDATE_KEY.BUFFER.READ(LV_REQUEST_KEY);
  exception
    when BUFFER_UNDERFLOW =>
      DS_DEBUG.BUFFER_UNDERFLOW("REQUEST_KEY_VALIDATE_KEY", "VALIDATE_KEY");
    end;
  end;

  -- Execution trigger condition check.
  if true then
    begin
      VALIDATE_KEY(
        REQUEST_KEY => LV_REQUEST_KEY,
        ISSUE_KEY => LV_ISSUE_KEY);
    exception
      when others =>
        DS_DEBUG.UNDECLARED_EXCEPTION("VALIDATE_KEY");
        EXCEPTION_HAS_OCCURRED := true;
        EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
      end;
    else return;
    end if;
  end;

  -- Exception Constraint translations.

  -- Other constraint option translations.

  -- Unconditional output translations.
  if not EXCEPTION_HAS_OCCURRED then

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```

        if EXCEPTION_HAS_OCCURRED then
            DS_DEBUG.UNHANDLED_EXCEPTION(
                "UPDATE_TIME",
                PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
        end if;
    end UPDATE_TIME_DRIVER;

-- Data trigger checks.
begin
    EXCEPTION_HAS_OCCURRED := FALSE;
    EXCEPTION_ID := PSDL_EXCEPTION;

    procedure HANDLE_QUERY_DRIVER is
        LV_FILTER : TRACKS_PKG.TRACKS;
        LV_TRACK_DB : TRACKS_PKG.TRACKS;
        LV_RESPOND_TRACKS : TRACKS_PKG.TRACKS;

        EXCEPTION_HAS_OCCURRED := FALSE;
        EXCEPTION_ID := PSDL_EXCEPTION;
    begin
        -- Data stream reads.
        begin
            DS_FILTER_HANDLE_QUERY.BUFFER.READ(LV_FILTER);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW("FILTER_HANDLE_QUERY", "HANDLE_QUERY");
        end;
        begin
            DS_TRACK_DB_HANDLE_QUERY.BUFFER.READ(LV_TRACK_DB);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW("TRACK_DB_HANDLE_QUERY", "HANDLE_QUERY");
        end;

        -- Execution trigger condition check.
        if True then
            begin
                HANDLE_QUERY(
                    FILTER => LV_FILTER,
                    TRACK_DB => LV_TRACK_DB,
                    RESPOND_TRACKS => LV_RESPOND_TRACKS);
            exception
                when others =>
                    DS_DEBUG.UNDECLARED_EXCEPTION("HANDLE_QUERY");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
        else return;
        end if;

        -- Exception Constraint translations.
        -- Other constraint option translations.

        -- Unconditional output translations.
        if not EXCEPTION_HAS_OCCURRED then
            begin
                DS_RESPOND_TRACKS_SERVER_THREAD_MANAGER.BUFFER.WRITE(LV_RESPOND_TRACKS);
            exception
                when BUFFER_OVERFLOW =>
                    DS_DEBUG.BUFFER_OVERFLOW("RESPOND_TRACKS_SERVER_THREAD_MANAGER", "HANDLE_QUERY");
        end;
    end if;

    -- PSDL Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "HANDLE_QUERY",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end HANDLE_QUERY_DRIVER;

-- Data trigger checks.
begin
    EXCEPTION_HAS_OCCURRED := FALSE;
    EXCEPTION_ID := PSDL_EXCEPTION;

    procedure UPDATE_FILTER_DRIVER is
        LV_REQ_TRACKS : TRACKS_PKG.TRACKS;
        LV_FILTER : TRACKS_PKG.TRACKS;

        EXCEPTION_HAS_OCCURRED := FALSE;
        EXCEPTION_ID := PSDL_EXCEPTION;
    begin
        -- Data stream reads.
        begin
            DS_FILTER_UPDATE_FILTER.BUFFER.READ(LV_FILTER);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW("FILTER_UPDATE_FILTER", "UPDATE_FILTER");
        end;
        begin
            DS_REQ_TRACKS_UPDATE_FILTER.BUFFER.READ(LV_REQ_TRACKS);
        exception
            when BUFFER_UNDERFLOW =>
                DS_DEBUG.BUFFER_UNDERFLOW("REQ_TRACKS_UPDATE_FILTER", "UPDATE_FILTER");
        end;

        -- Execution trigger condition check.
        if True then
            begin
                UPDATE_FILTER(
                    REQ_TRACKS => LV_REQ_TRACKS,
                    FILTER => LV_FILTER);
            exception
                when others =>
                    DS_DEBUG.UNDECLARED_EXCEPTION("UPDATE_FILTER");
            EXCEPTION_HAS_OCCURRED := true;
            EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
        end;
        else return;
        end if;

        -- Exception Constraint translations.
        -- Other constraint option translations.

        -- Unconditional output translations.
        if not EXCEPTION_HAS_OCCURRED then
            begin
                DS_FILTER_UPDATE_FILTER.BUFFER.WRITE(LV_FILTER);
            exception
                when BUFFER_OVERFLOW =>
                    DS_DEBUG.BUFFER_OVERFLOW("FILTER_UPDATE_FILTER", "UPDATE_FILTER");
        end;
        begin
            DS_FILTER_HANDLE_QUERY.BUFFER.WRITE(LV_FILTER);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("FILTER_HANDLE_QUERY", "UPDATE_FILTER");
        end;
    end if;

    -- PSDL Exception handler.
    if EXCEPTION_HAS_OCCURRED then
        DS_DEBUG.UNHANDLED_EXCEPTION(
            "UPDATE_FILTER",
            PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
    end if;
end UPDATE_FILTER_DRIVER;

```

```

PSDL_EXCEPTION('IMAGE(EXCEPTION_ID));
end if;
end UPDATE_FILTER_DRIVER;

```

```

procedure UPDATE_TRACKS_DRIVER is
  LV_FEED_TRACKS : TRACKS_PKG.TRACKS;
  LV_TRACK_DB : TRACKS_PKG.TRACKS;

```

```

  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;

```

```

begin
  Data trigger checks.

```

```

-- Data stream reads.

```

```

begin
  DS_FEED_TRACKS.UPDATE_TRACKS.BUFFER.READ(LV_FEED_TRACKS);
exception
  when BUFFER_UNDERFLOW =>

```

```

    DS_DEBUG.BUFFER_UNDERFLOW("FEED_TRACKS.UPDATE_TRACKS", "UPDATE_TRACKS");
end;

```

```

begin
  DS_TRACK_DB.UPDATE_TRACKS.BUFFER.READ(LV_TRACK_DB);
exception
  when BUFFER_UNDERFLOW =>

```

```

    DS_DEBUG.BUFFER_UNDERFLOW("TRACK_DB.UPDATE_TRACKS", "UPDATE_TRACKS");
end;

```

```

-- Execution trigger condition check.

```

```

if True then

```

```

begin
  UPDATE_TRACKS(

```

```

    FEED_TRACKS => LV_FEED_TRACKS,
    TRACK_DB => LV_TRACK_DB);

```

```

exception
  when others =>

```

```

    DS_DEBUG.UNDECLARED_EXCEPTION("UPDATE_TRACKS");
    EXCEPTION_HAS_OCCURRED := true;

```

```

    EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;

```

```

else return;
end if;

```

```

-- Exception Constraint translations.

```

```

-- Other constraint option translations.

```

```

-- Unconditional output translations.

```

```

if not EXCEPTION_HAS_OCCURRED then

```

```

begin

```

```

  DS_TRACK_DB.UPDATE_TRACKS.BUFFER.WRITE(LV_TRACK_DB);

```

```

exception
  when BUFFER_OVERFLOW =>

```

```

    DS_DEBUG.BUFFER_OVERFLOW("TRACK_DB.UPDATE_TRACKS", "UPDATE_TRACKS");
end;

```

```

begin
  DS_TRACK_DB.HANDLE_QUERY.BUFFER.WRITE(LV_TRACK_DB);

```

```

exception
  when BUFFER_OVERFLOW =>

```

```

    DS_DEBUG.BUFFER_OVERFLOW("TRACK_DB.HANDLE_QUERY", "UPDATE_TRACKS");
end;

```

```

end if;

```

```

-- PSDL Exception handler.

```

```

if EXCEPTION_HAS_OCCURRED then

```

```

  DS_DEBUG.UNHANDLED_EXCEPTION;

```

```

PSDL_EXCEPTION('IMAGE(EXCEPTION_ID));
end if;
end UPDATE_TRACKS_DRIVER;

```

```

procedure BUSINESS_RULES_MANAGER_DRIVER is
  LV_CLIENT_REQ : MESSAGE_PKG.MESSAGE;
  LV_SRV_RESPONSE : MESSAGE_PKG.MESSAGE;
  LV_MOD_RULES : ADMINISTER_PKG.ADMINISTER;
  LV_VALID_CLIENT_REQ : MESSAGE_PKG.MESSAGE;
  LV_VALID_SRV_RESPONSE : MESSAGE_PKG.MESSAGE;

```

```

  EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
  EXCEPTION_ID : PSDL_EXCEPTION;

```

```

begin

```

```

  Data trigger checks.

```

```

-- Data stream reads.

```

```

begin
  DS_CLIENT_REQ.BUSINESS_RULES_MANAGER.BUFFER.READ(LV_CLIENT_REQ);
exception
  when BUFFER_UNDERFLOW =>

```

```

    DS_DEBUG.BUFFER_UNDERFLOW("CLIENT_REQ.BUSINESS_RULES_MANAGER", "BUSINESS_R
ULES_MANAGER");
end;

```

```

begin
  DS_MOD_RULES.BUSINESS_RULES_MANAGER.BUFFER.READ(LV_MOD_RULES);
exception
  when BUFFER_UNDERFLOW =>

```

```

    DS_DEBUG.BUFFER_UNDERFLOW("MOD_RULES.BUSINESS_RULES_MANAGER", "BUSINESS_RU
LES_MANAGER");
end;

```

```

begin
  DS_SRV_RESPONSE.BUSINESS_RULES_MANAGER.BUFFER.READ(
LV_SRV_RESPONSE);
exception
  when BUFFER_UNDERFLOW =>

```

```

    DS_DEBUG.BUFFER_UNDERFLOW("SRV_RESPONSE.BUSINESS_RULES_MANAGER", "BUSINESS_RU
LES_MANAGER");
end;

```

```

begin
  DS_CLIENT_REQ => LV_CLIENT_REQ,
  SRV_RESPONSE => LV_SRV_RESPONSE,
  MOD_RULES => LV_MOD_RULES,
  VALID_CLIENT_REQ => LV_VALID_CLIENT_REQ,
  VALID_SRV_RESPONSE => LV_VALID_SRV_RESPONSE);

```

```

exception
  when others =>

```

```

    DS_DEBUG.UNDECLARED_EXCEPTION("BUSINESS_RULES_MANAGER");
    EXCEPTION_HAS_OCCURRED := true;

```

```

    EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;

```

```

-- Execution trigger condition check.

```

```

if True then

```

```

begin
  BUSINESS_RULES_MANAGER(
    CLIENT_REQ => LV_CLIENT_REQ,
    SRV_RESPONSE => LV_SRV_RESPONSE,
    MOD_RULES => LV_MOD_RULES,
    VALID_CLIENT_REQ => LV_VALID_CLIENT_REQ,
    VALID_SRV_RESPONSE => LV_VALID_SRV_RESPONSE);

```

```

exception
  when others =>

```

```

    DS_DEBUG.UNDECLARED_EXCEPTION("BUSINESS_RULES_MANAGER");
    EXCEPTION_HAS_OCCURRED := true;

```

```

    EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;

```

```

else return;
end if;

```

```

-- Exception Constraint translations.

```

```

-- Other constraint option translations.

```

```

-- Unconditional output translations.

```

```

if not EXCEPTION_HAS_OCCURRED then

```

```

  begin
    DS_MOD_RULES.BUSINESS_RULES_MANAGER.BUFFER.WRITE(LV_MOD_RULES);

```







```

exception
    when BUFFER_OVERFLOW =>
        DS_DEBUG.BUFFER_OVERFLOW("ISS_SIGNATURE_SECURITY_MANAGER", "CLIENT_THREAD_MANAGER");
end if;
begin
    if not EXCEPTION_HAS_OCCURRED then
        begin
            DS_PRINT_RESPONSE_PRINT_MANAGER.BUFFER.WRITE(LV_PRINT_RESPONSE);
        exception
            when BUFFER_OVERFLOW =>
                DS_DEBUG.BUFFER_OVERFLOW("PRINT_RESPONSE_PRINT_MANAGER", "CLIENT_THREAD_MANAGER");
        end;
    end if;
end if;

-- PSDL Exception handler.
if EXCEPTION_HAS_OCCURRED then
    DS_DEBUG.UNHANDLED_EXCEPTION(
        "CLIENT_THREAD_MANAGER",
        PSDL_EXCEPTION_IMAGE(EXCEPTION_ID));
end if;
end CLIENT_THREAD_MANAGER_DRIVER;

procedure SERVER_THREAD_MANAGER_DRIVER is
    LV_FTP_MSG_IN : MESSAGE_PKG.MESSAGE;
    LV_HTTP_MSG_IN : MESSAGE_PKG.MESSAGE;
    LV_SMTMP_MSG_IN : MESSAGE_PKG.MESSAGE;
    LV_SNMP_MSG_IN : MESSAGE_PKG.MESSAGE;
    LV_UDP_MSG_IN : MESSAGE_PKG.MESSAGE;
    LV_DELIVER_MAP : MAP;
    LV_DEVICE_STATUS : BOOLEAN;
    LV_ISSUE_CERTIFICATE : CERTIFICATE_PKG.CERTIFICATE;
    LV_ISSUE_KEY : KEY_PKG.KEY;
    LV_JOB_SPOOLED_MSG : MESSAGE_PKG.MESSAGE;
    LV_NEW_TIME : TIMESTAMP_PKG.TIMESTAMP;
    LV_REQUEST_FILE : MESSAGE_PKG.MESSAGE;
    LV_RESOURCE_PHYS_LOC : MESSAGE_PKG.MESSAGE;
    LV_RESPOND_ALERTS : ALERT_PKG.ALERT;
    LV_RESPOND_MSG : MESSAGE_PKG.MESSAGE;
    LV_RESPOND_MSGS : MESSAGE_PKG.MESSAGE;
    LV_RESPOND_TEMPLATE : MESSAGE_PKG.MESSAGE;
    LV_RESPOND_TRACKS : TRACKS_PKG.TRACKS;
    LV_RESPOND_VALID_TRACKS : TRACKS_PKG.TRACKS;
    LV_SUBSCRIBE_DB_CHANGES : DB_RECORD_PKG.DB_RECORD;
    LV_VALID_CLIENT_REQ : MESSAGE_PKG.MESSAGE;
    LV_ADMINISTER_DEVICE : DEVICE_PKG.DEVICE;
    LV_CS_DEL_TRACKS : TRACKS_PKG.TRACKS;
    LV_FEED_MSGS : MESSAGE_PKG.MESSAGE;
    LV_PRINT_REQUEST : MESSAGE_PKG.MESSAGE;
    LV_RECEIVE_FILE : MESSAGE_PKG.MESSAGE;
    LV_REQ_ALERTS : ALERT_PKG.ALERT;
    LV_REQ_DATA : DB_RECORD_PKG.DB_RECORD;
    LV_REQ_RESOURCE : MESSAGE_PKG.MESSAGE;
    LV_REQ_TEMPLATE : MESSAGE_PKG.MESSAGE;
    LV_REQ_TRACKS : TRACKS_PKG.MESSAGE;
    LV_REQUEST_CERTIFICATE : CERTIFICATE_PKG.CERTIFICATE;
    LV_REQUEST_KEY : KEY_PKG.KEY;
    LV_REQUEST_MAP : MAP;
    LV_REQUEST_MSGS : MESSAGE_PKG.MESSAGE;
    LV_REQUEST_SIGNATURE : SIGNATURE_PKG.SIGNATURE;
    LV_REQUEST_TRACKS : TRACKS_PKG.TRACKS;
    LV_RESPOND_DB_CHANGE : DB_RECORD_PKG.DB_RECORD;
    LV_SESSION_CONTROL : MESSAGE_PKG.MESSAGE;

```

```

    LV_SESSION_DATA : MESSAGE_PKG.MESSAGE;
    LV_SRV_RESPONSE : MESSAGE_PKG.MESSAGE;
    EXCEPTION_HAS_OCCURRED : BOOLEAN := FALSE;
    EXCEPTION_ID : PSDL_EXCEPTION;
begin
    -- Data trigger checks.
    -- Data stream reads.
begin
    DS_FTP_MSG_IN_SERVER_THREAD_MANAGER.BUFFER.READ(LV_FTP_MSG_IN);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("FTP_MSG_IN_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
begin
    DS_HTTP_MSG_IN_SERVER_THREAD_MANAGER.BUFFER.READ(LV_HTTP_MSG_IN);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("HTTP_MSG_IN_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
begin
    DS_SMTMP_MSG_IN_SERVER_THREAD_MANAGER.BUFFER.READ(LV_SMTMP_MSG_IN);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("SMTMP_MSG_IN_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
begin
    DS_SNMP_MSG_IN_SERVER_THREAD_MANAGER.BUFFER.READ(LV_SNMP_MSG_IN);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("SNMP_MSG_IN_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
begin
    DS_UDP_MSG_IN_SERVER_THREAD_MANAGER.BUFFER.READ(LV_UDP_MSG_IN);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("UDP_MSG_IN_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
begin
    DS_DELIVER_MAP_SERVER_THREAD_MANAGER.BUFFER.READ(LV_DELIVER_MAP);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("DELIVER_MAP_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
begin
    DS_DEVICE_STATUS_SERVER_THREAD_MANAGER.BUFFER.READ(LV_DEVICE_STATUS);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("DEVICE_STATUS_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
begin
    DS_ISSUE_CERTIFICATE_SERVER_THREAD_MANAGER.BUFFER.READ(LV_ISSUE_CERTIFICATE);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("ISSUE_CERTIFICATE_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
begin
    DS_ISSUE_KEY_SERVER_THREAD_MANAGER.BUFFER.READ(LV_ISSUE_KEY);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("ISSUE_CERTIFICATE_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
begin
    DS_SESSION_CONTROL_SERVER_THREAD_MANAGER.BUFFER.READ(LV_SESSION_CONTROL);
exception
    when BUFFER_UNDERFLOW =>
        DS_DEBUG.BUFFER_UNDERFLOW("SESSION_CONTROL_SERVER_THREAD_MANAGER", "SERVER_THREAD_MANAGER");
end;
end SERVER_THREAD_MANAGER_DRIVER;

```

```

exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("ISSUE_KEY_SERVER_THREAD_MANAGER", "SERVER_THREAD_MA
NAGER");
end;

```

```

begin
  DS_ISSUE.SIGNATURE_SERVER_THREAD_MANAGER.BUFFER.READ(LV_ISSUE.SIGNATURE);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("ISSUE_SIGNATURE_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

begin
  DS_JOB.SPOOLED_MSG_SERVER_THREAD_MANAGER.BUFFER.READ(LV_JOB.SPOOLED_MSG);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("JOB_SPOOLED_MSG_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

begin
  DS_NEW_TIME_SERVER_THREAD_MANAGER.BUFFER.READ(LV_NEW_TIME);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("NEW_TIME_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

begin
  DS_REQUEST_FILE_SERVER_THREAD_MANAGER.BUFFER.READ(LV_REQUEST_FILE);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("REQUEST_FILE_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

begin
  DS_RESOURCE_PHYS_LOC_SERVER_THREAD_MANAGER.BUFFER.READ(LV_RESOURCE_PHYS_LOC);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("RESOURCE_PHYS_LOC_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

begin
  DS_RESPONSE_ALERTS_SERVER_THREAD_MANAGER.BUFFER.READ(LV_RESPONSE_ALERTS);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("RESPOND_ALERTS_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

begin
  DS_RESPONSE_MSG_SERVER_THREAD_MANAGER.BUFFER.READ(LV_RESPONSE_MSG);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("RESPOND_MSG_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

begin
  DS_RESPONSE_MSGS_SERVER_THREAD_MANAGER.BUFFER.READ(LV_RESPONSE_MSGS);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("RESPOND_MSGS_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

begin
  DS_DEBUG.BUFFER_UNDERFLOW("RESPOND_ALERTS_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

begin
  DS_RESPONSE_TEMPLATE_SERVER_THREAD_MANAGER.BUFFER.READ(LV_RESPONSE_TEMPLATE);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("RESPOND_ALERTS_SERVER_THREAD_MANAGER", "SERVER_THR
EAD_MANAGER");
end;

```

```

end;
begin
  DS_RESPONSE_TRACKS_SERVER_THREAD_MANAGER.BUFFER.READ(LV_RESPONSE_TRACKS);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("RESPOND_TRACKS_SERVER_THREAD_MANAGER", "SERVER_
THREAD_MANAGER");
end;

```

```

begin
  DS_RESPONSE_VALID_TRACKS_SERVER_THREAD_MANAGER.BUFFER.READ(LV_RESPONSE_VALID_T
RACKS);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("RESPOND_VALID_TRACKS_SERVER_THREAD_MANAGER", "S
ERVER_THREAD_MANAGER");
end;

```

```

begin
  DS_SRV_RESPONSE_SERVER_THREAD_MANAGER.BUFFER.READ(LV_SRV_RESPONSE);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("SRV_RESPONSE_SERVER_THREAD_MANAGER", "SERVER_TH
READ_MANAGER");
end;

```

```

begin
  DS_SUBSCRIBE_DB_CHANGES_SERVER_THREAD_MANAGER.BUFFER.READ(LV_SUBSCRIBE_DB_CH
ANGES);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("SUBSCRIBE_DB_CHANGES_SERVER_THREAD_MANAGER", "S
ERVER_THREAD_MANAGER");
end;

```

```

begin
  DS_SUBSCRIBE_TRACKS_SERVER_THREAD_MANAGER.BUFFER.READ(LV_SUBSCRIBE_TRACKS);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("SUBSCRIBE_TRACKS_SERVER_THREAD_MANAGER", "SERVE
R_THREAD_MANAGER");
end;

```

```

begin
  DS_VALID_CLIENT_REQ_SERVER_THREAD_MANAGER.BUFFER.READ(LV_VALID_CLIENT_REQ);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("VALID_CLIENT_REQ_SERVER_THREAD_MANAGER", "SERVE
R_THREAD_MANAGER");
end;

```

```

begin
  DS_VALID_CLIENT_REQ_SERVER_THREAD_MANAGER.BUFFER.READ(LV_VALID_CLIENT_REQ);
exception
  when BUFFER_UNDERFLOW =>
    DS_DEBUG.BUFFER_UNDERFLOW("VALID_CLIENT_REQ_SERVER_THREAD_MANAGER", "SERVE
R_THREAD_MANAGER");
end;

```

```

-- Execution trigger condition check.
if True then
  begin
    SERVER_THREAD_MANAGER(
      FTP_MSG_IN => LV_FTP_MSG_IN,
      HTTP_MSG_IN => LV_HTTP_MSG_IN,
      SMTP_MSG_IN => LV_SMTP_MSG_IN,
      SNMP_MSG_IN => LV_SNMP_MSG_IN,
      UDP_MSG_IN => LV_UDP_MSG_IN,
      DELIVER_MAP => LV_DELIVER_MAP,
      DEVICE_STATUS => LV_DEVICE_STATUS,
      ISSUE_CERTIFICATE => LV_ISSUE_CERTIFICATE,
      ISSUE_KEY => LV_ISSUE_KEY,
      ISSUE_SIGNATURE => LV_ISSUE_SIGNATURE,
      JOB_SPOOLED_MSG => LV_JOB_SPOOLED_MSG,
      NEW_TIME => LV_NEW_TIME,
      REQUEST_FILE => LV_REQUEST_FILE,
      RESOURCE_PHYS_LOC => LV_RESOURCE_PHYS_LOC,
      RESPONSE_ALERTS => LV_RESPONSE_ALERTS,
    );
  end;
end;

```

```

RESPOND_TEMPLATE => LV_RESPOND_TEMPLATE,
RESPOND_TRACKS => LV_RESPOND_TRACKS,
RESPOND_VALID_TRACKS => LV_RESPOND_VALID_TRACKS,
SUBSCRIBE_DB_CHANGES => LV_SUBSCRIBE_DB_CHANGES,
SUBSCRIBE_TRACKS => LV_SUBSCRIBE_TRACKS,
VALID_CLIENT_REQ => LV_VALID_CLIENT_REQ,
ADMINISTER_DEVICE => LV_ADMINISTER_DEVICE,
CS_DEL_TRACKS => LV_CS_DEL_TRACKS,
FEED_MSGS => LV_FEED_MSGS,
PRINT_REQUEST => LV_PRINT_REQUEST,
RECEIVE_FILE => LV_RECEIVE_FILE,
REQ_ALERTS => LV_REQ_ALERTS,
REQ_DATA => LV_REQ_DATA,
REQ_RESOURCE => LV_REQ_RESOURCE,
REQ_TEMPLATE => LV_REQ_TEMPLATE,
REQ_TRACKS => LV_REQ_TRACKS,
REQUEST_CERTIFICATE => LV_REQUEST_CERTIFICATE,
REQUEST_KEY => LV_REQUEST_KEY,
REQUEST_MAP => LV_REQUEST_MAP,
REQUEST_MSGS => LV_REQUEST_MSGS,
REQUEST_SIGNATURE => LV_REQUEST_SIGNATURE,
REQUEST_TRACKS => LV_REQUEST_TRACKS,
RESPOND_DB_CHANGE => LV_RESPOND_DB_CHANGE,
SESSION_CONTROL => LV_SESSION_CONTROL,
SESSION_DATA => LV_SESSION_DATA,
SRV_RESPONSE => LV_SRV_RESPONSE);
exception
when others =>
DS_DEBUG.UNDECLARED_EXCEPTION("SERVER_THREAD_MANAGER");
EXCEPTION_HAS_OCCURRED := true;
EXCEPTION_ID := UNDECLARED_ADA_EXCEPTION;
end;
else return;
end if;

-- Exception Constraint translations.

-- Other constraint option translations.

--Unconditional output translations.
if not EXCEPTION_HAS_OCCURRED then
begin
DS_ADMINISTER_DEVICE_MOUNT_DEVICE.BUFFER.WRITE(LV_ADMINISTER_DEVICE);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("ADMINISTER_DEVICE_MOUNT_DEVICE", "SERVER_THREAD_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_CS_DEL_TRACKS_CORREL_UPDATE_TRACKS.BUFFER.WRITE(LV_CS_DEL_TRACKS);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("CS_DEL_TRACKS_CORREL_UPDATE_TRACKS", "SERVER_THREAD_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_FEED_MSGS_ARCHIVE_MSGS.BUFFER.WRITE(LV_FEED_MSGS);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("FEED_MSGS_ARCHIVE_MSGS", "SERVER_THREAD_MANAGER");
end;
begin
DS_FEED_MSGS_UPDATE_MSGS.BUFFER.WRITE(LV_FEED_MSGS);

```

```

exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("FEED_MSGS_UPDATE_MSGS", "SERVER_THREAD_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_PRINT_REQUEST_CHECK_FOR_FILE.BUFFER.WRITE(LV_PRINT_REQUEST);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("PRINT_REQUEST_CHECK_FOR_FILE", "SERVER_THREAD_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_RECEIVE_FILE_CHECK_FOR_FILE.BUFFER.WRITE(LV_RECEIVE_FILE);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("RECEIVE_FILE_CHECK_FOR_FILE", "SERVER_THREAD_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_ALERTS_ALERTS_UPDATE_FILTER.BUFFER.WRITE(LV_REQ_ALERTS);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_ALERTS_ALERTS_UPDATE_FILTER", "SERVER_THREAD_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_DATA_RESOLVE_DATA_TYPE.BUFFER.WRITE(LV_REQ_DATA);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_DATA_RESOLVE_DATA_TYPE", "SERVER_THREAD_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_RESOURCE_RESOLVE_RESOURCE_LOC.BUFFER.WRITE(LV_REQ_RESOURCE);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_RESOURCE_RESOLVE_RESOURCE_LOC", "SERVER_THREAD_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_TEMPLATE_TEMPLATE_DATABASE.BUFFER.WRITE(LV_REQ_TEMPLATE);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_TEMPLATE_TEMPLATE_DATABASE", "SERVER_THREAD_MANAGER");
end;
end if;
if not EXCEPTION_HAS_OCCURRED then
begin
DS_REQ_TRACKS_UPDATE_FILTER.BUFFER.WRITE(LV_REQ_TRACKS);
exception
when BUFFER_OVERFLOW =>
DS_DEBUG.BUFFER_OVERFLOW("REQ_TRACKS_UPDATE_FILTER", "SERVER_THREAD_MANAGER");
end;

```



```

msg_display_db_driver;
track_display_db_driver;
resolve_alerts_driver;
correlate_tracks_driver;
msg_handle_query_driver;
update_time_driver;
handle_query_driver;
business_rules_manager_driver;
msg_out_manager_driver;
print_manager_driver;
network_interface_in_driver;
correl_handle_query_driver;
security_manager_driver;
session_manager_driver;
client_thread_manager_driver;
ftp_processor_in_driver;
ftp_processor_out_driver;
http_processor_in_driver;
http_processor_out_driver;
smtp_processor_in_driver;
smtp_processor_out_driver;
snmp_processor_in_driver;
snmp_processor_out_driver;
udp_processor_in_driver;
udp_processor_out_driver;
server_thread_manager_driver;
network_interface_out_driver;
update_msgs_driver;
alerts_update_filter_driver;
correl_update_tracks_driver;
correl_update_filter_driver;
update_tactical_db_driver;
resolve_data_type_driver;
mount_device_driver;
locate_map_driver;
archive_msgs_driver;
template_database_driver;
msg_update_filter_driver;
resolve_resource_loc_driver;
check_for_file_driver;
validate_certificate_driver;
validate_key_driver;
validate_signature_driver;
update_filter_driver;
resolve_request_type_driver;
build_file_driver;
add_file_driver;
add_object_driver;
add_record_driver;
delete_file_driver;
delete_object_driver;
delete_record_driver;
mod_file_driver;
mod_object_driver;
mod_record_driver;
retrieve_file_driver;
retrieve_object_driver;
retrieve_record_driver;
spool_file_driver;
format_response_driver;
update_tracks_driver;
end loop;
end DYNAMIC_SCHEDULE_TYPE;

```

```

procedure START_DYNAMIC_SCHEDULE is
begin
DYNAMIC_SCHEDULE.START;

```

```

end START_DYNAMIC_SCHEDULE;

end SAAMC_DYNAMIC_SCHEDULERS;

package SAAMC_STATIC_SCHEDULERS is
procedure START_STATIC_SCHEDULE;
end SAAMC_STATIC_SCHEDULERS;

```

```

with SAAMC_DRIVERS; use SAAMC_DRIVERS;
with PRIORITY_DEFINITIONS; use PRIORITY_DEFINITIONS;
with PSDL_TIMERS; use PSDL_TIMERS;
with TEXT_IO; use TEXT_IO;
package body SAAMC_STATIC_SCHEDULERS is
pragma priority (STATIC_SCHEDULE_PRIORITY);
entry START;
end STATIC_SCHEDULE_TYPE;
for STATIC_SCHEDULE_TYPE'SORAGE_SIZE use 200_000;
STATIC_SCHEDULE : STATIC_SCHEDULE_TYPE;
task body STATIC_SCHEDULE_TYPE is
PERIOD : duration;
TADIL_J_START_TIME1 : duration;
TADIL_J_STOP_TIME1 : duration;
schedule_timer : TIMER := NEW_TIMER;
begin
accept START;
PERIOD := TARGET_TO_HOST(duration(1.000000000000000E+00));
TADIL_J_START_TIME1 := TARGET_TO_HOST(duration(0.000000000000000E+00));
TADIL_J_STOP_TIME1 := TARGET_TO_HOST(duration(1.000000000000000E-01));
START(schedule_timer);
loop
delay (TADIL_J_START_TIME1 - HOST_DURATION(schedule_timer));
TADIL_J_DRIVER;
if HOST_DURATION(schedule_timer) > TADIL_J_STOP_TIME1 then
PUT_LINE("timing error from operator TADIL.J");
SUBTRACT_HOST_TIME_FROM_ALL_TIMERS(HOST_DURATION(schedule_timer) - TADIL_J
_STOP_TIME1);
end if;
delay (PERIOD - HOST_DURATION(schedule_timer));
RESET(schedule_timer);
end loop;
end STATIC_SCHEDULE_TYPE;
procedure START_STATIC_SCHEDULE is
begin
STATIC_SCHEDULE.START;
end START_STATIC_SCHEDULE;
end SAAMC_STATIC_SCHEDULERS;

with SAAMC_STATIC_SCHEDULERS; use SAAMC_STATIC_SCHEDULERS;
with SAAMC_DYNAMIC_SCHEDULERS; use SAAMC_DYNAMIC_SCHEDULERS;
with CAPS_HARDWARE_MODEL; use CAPS_HARDWARE_MODEL;
procedure SAAMC is
begin
init_hardware_model;
start_static_schedule;
start_dynamic_schedule;
end SAAMC;

```

```
--filename: SAAMC.add_file.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package adds DB_RECORDS types to database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package ADD_FILE_PKG is

  procedure ADD_FILE(REQ_ADD_FILE : in DB_RECORD; FILE_ADD_DB : out DB_RECORD);
end ADD_FILE_PKG;

package body ADD_FILE_PKG is

  procedure ADD_FILE (REQ_ADD_FILE : in DB_RECORD; FILE_ADD_DB : out DB_RECORD) is
  begin
    Put_line(Item => "Inside operator ADD FILE");
  end ADD_FILE;
end ADD_FILE_PKG;
```

```

--filename: SAAMC.add_object.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package adds DB_RECORDS types to database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package ADD_OBJECT_PKG is

  procedure ADD_OBJECT(REQ_ADD_OBJ : in DB_RECORD; OBJ_ADD_DB : out DB_RECORD);

end ADD_OBJECT_PKG;

package body ADD_OBJECT_PKG is

  procedure ADD_OBJECT (REQ_ADD_OBJ : in DB_RECORD; OBJ_ADD_DB : out DB_RECORD) is
  begin
    Put_Line(Item => "Inside operator ADD OBJECT");

  end ADD_OBJECT;

end ADD_OBJECT_PKG;

```

```
--filename: SAAWC.add_record.a
--
--Author: Capt Malt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package adds DB_RECORDS types to database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package ADD_RECORD_PKG is

  procedure ADD_RECORD(REQ_ADD_REC : in DB_RECORD; REC_ADD_DB : out DB_RECORD);

end ADD_RECORD_PKG;

package body ADD_RECORD_PKG is

  procedure ADD_RECORD (REQ_ADD_REC : in DB_RECORD; REC_ADD_DB : out DB_RECORD) is
  begin
    Put_line(Item => "Inside operator ADD_RECORD");
  end ADD_RECORD;

end ADD_RECORD_PKG;
```



```

--filename: SAAMC.administer.a
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose:

This file is where I declare the type ADMINISTER

with text_io;
use text_io;
with file_name_pkg;
use file_name_pkg;

package ADMINISTER_PKG is

type ADMINISTER is record

  administer_name : file_name;
  request : Boolean := True;

end record;

function EMPTY return ADMINISTER;

end ADMINISTER_PKG;

package body ADMINISTER_PKG is

function EMPTY return ADMINISTER is

  dummy : ADMINISTER;

begin

  dummy.administer_name := (OTHERS => ' ');

  return dummy;

end EMPTY;

end ADMINISTER_PKG;

```

```
--filename: SAAMC.alert.a
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose:

--This file is where I declare the type ALERT

with text_io;use text_io;
with file_name_pkg;use file_name_pkg;
with timestamp_pkg;use timestamp_pkg;
with db_record_pkg;use db_record_pkg;
with tracks_pkg;use tracks_pkg;

package ALERT_PKG is

  --type alert_type is(DB_RECORD_ALERT,TRACKS_ALERT,UNK_ALERT);
  --type ALERT(kind : alert_type);
  type Alert;
  type ALERT_ACCESS is access ALERT;

  --type ALERT(kind : alert_type) is record
  type ALERT is record

    alert_id : Natural := 0;
    alert_pri : Natural range 1..5;
    alert_src : String(1..10) := " ";
    alert_dest : String(1..10) := " ";
    request : Boolean := True;

    case kind is
      -- when DB_RECORD_ALERT =>
      --   db_record_alert : DB_RECORD;
      -- when TRACKS_ALERT =>
      --   tracks_alert : TRACKS;
      -- when UNK_ALERT =>
      --   NULL;
      -- when OTHERS =>
      --   NULL;
    end case;

    db_record_alert : DB_RECORD_ACCESS := NULL;
    tracks_alert : TRACKS_ACCESS := NULL;

  end record;

function EMPTY return ALERT;

end ALERT_PKG;

package body ALERT_PKG is

function EMPTY return ALERT is

  dummy : ALERT;

begin

  return dummy;

end EMPTY;

end ALERT_PKG;
```

```

--filename: SAAMC.alerts_display_db.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package displays alerts to the user

with text_io;use text_io;
with ALERT_PKG;use ALERT_PKG;

package ALERTS_DISPLAY_DB_PKG is

  procedure ALERTS_DISPLAY_DB(AD_DEL_ALERTS : in ALERT; AD_SUB_ALERTS : out ALERT;
                               FILTER_ALERTS : in ALERT);

end ALERTS_DISPLAY_DB_PKG;

package body ALERTS_DISPLAY_DB_PKG is

  procedure ALERTS_DISPLAY_DB(AD_DEL_ALERTS : in ALERT; AD_SUB_ALERTS : out ALERT;
                               FILTER_ALERTS : in ALERT) is
  begin
    Put_line(Item => "Inside operator ALERTS_DISPLAY_DB");
  end ALERTS_DISPLAY_DB;

end ALERTS_DISPLAY_DB_PKG;

```

```
--filename: SAAWC.alerts_update_filter.a
--
--Author: Capt Malt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package updates the alert filter as the user desires

With text_io;use text_io;
with ALERT_PKG;use ALERT_PKG;
with TRACKS_PKG;use TRACKS_PKG;

package ALERTS_UPDATE_FILTER_PKG is

  procedure ALERTS_UPDATE_FILTER(REQ_ALERTS : in ALERT; ALERTS_FILTER : out TRACKS);
end ALERTS_UPDATE_FILTER_PKG;

package body ALERTS_UPDATE_FILTER_PKG is

  procedure ALERTS_UPDATE_FILTER(REQ_ALERTS : in ALERT; ALERTS_FILTER : out TRACKS) is
  begin
    Put_line(item => "Inside operator ALERTS_UPDATE_FILTER");
  end ALERTS_UPDATE_FILTER;

end ALERTS_UPDATE_FILTER_PKG;
```

```

--filename: SAAMC.archive_msgs.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package receives messages and updates the message database

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package ARCHIVE_MSGS_PKG is

    procedure ARCHIVE_MSGS(FEED_MSGS: in MESSAGE; MSG_MESSAGE_DB: out MESSAGE);
end ARCHIVE_MSGS_PKG;

package body ARCHIVE_MSGS_PKG is

    procedure ARCHIVE_MSGS(FEED_MSGS: in MESSAGE; MSG_MESSAGE_DB: out MESSAGE) is
    begin
        Put_Line(Item => "Inside operator ARCHIVE_MSGS");
    end ARCHIVE_MSGS;
end ARCHIVE_MSGS_PKG;

```

```
--filename: SAAMC.bits.a.
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose:

--This file is where I declare the type BITS

with text_io;use text_io;
with file_name_pkg;use file_name_pkg;
with MESSAGE_PKG;use MESSAGE_PKG;

package BITS_PKG is

type BITS is record

--  bits_message : MESSAGE(kind => UNK_MSG);
--  bits_message : MESSAGE;
end record;

function EMPTY return BITS;

end BITS_PKG;

package body BITS_PKG is

function EMPTY return BITS is

    dummy : BITS;

begin

    return dummy;

end EMPTY;

end BITS_PKG;
```

```

--filename: SAAWC.build_file.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package takes screen info and writes it to a file for printing

with text_io;use text_io;
with PARAM_PKG;use PARAM_PKG;
with PATH_PKG;use PATH_PKG;

package BUILD_FILE_PKG is

  procedure BUILD_FILE(SCREEN_PARAM : in PARAM; FILE_NAME : out PATH);

end BUILD_FILE_PKG;

package body BUILD_FILE_PKG is

  procedure BUILD_FILE(SCREEN_PARAM : in PARAM; FILE_NAME : out PATH) is
  begin
    Put_Line(item => "Inside operator BUILD_FILE");

  end BUILD_FILE;

end BUILD_FILE_PKG;

```

```
--filename: SAAWC.business_rules_manager.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package allows the user to modify the way clients and servers behave

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;
with ADMINISTER_PKG;use ADMINISTER_PKG;

package BUSINESS_RULES_MANAGER_PKG is

  procedure BUSINESS_RULES_MANAGER(CLIENT_REQ : in MESSAGE; SRV_RESPONSE : in MESSAGE;
    MOD_RULES : in ADMINISTER; VALID_CLIENT_REQ : out MESSAGE;
    VALID_SRV_RESPONSE : out MESSAGE);

end BUSINESS_RULES_MANAGER_PKG;

package body BUSINESS_RULES_MANAGER_PKG is

  procedure BUSINESS_RULES_MANAGER(CLIENT_REQ : in MESSAGE; SRV_RESPONSE : in MESSAGE;
    MOD_RULES : in ADMINISTER; VALID_CLIENT_REQ : out MESSAGE;
    VALID_SRV_RESPONSE : out MESSAGE) is
begin
  Put_Line(Item => "Inside operator BUSINESS_RULES_MANAGER");
end BUSINESS_RULES_MANAGER;

end BUSINESS_RULES_MANAGER_PKG;
```



```

--Author: Capt Malt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose:

--This file is where I declare the type CERTIFICATE

with text_io;
use text_io;
with file_name_pkg;
use file_name_pkg;

package CERTIFICATE_PKG is

type CERTIFICATE is record

  certificate_name : file_name;
  request : Boolean := True;

end record;

function EMPTY return CERTIFICATE;

end CERTIFICATE_PKG;

package body CERTIFICATE_PKG is

function EMPTY return CERTIFICATE is

  dummy : CERTIFICATE;

begin

  dummy.certificate_name := (OTHERS => ' ');
  return dummy;

end EMPTY;

end CERTIFICATE_PKG;

```

```
--filename: SAAWC.check_for_file.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package receives a print request and determines if the file exists
--         or needs to be built

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;
with PATH_PKG;use PATH_PKG;
with PARAM_PKG;use PARAM_PKG;

package CHECK_FOR_FILE_PKG is

  procedure CHECK_FOR_FILE(PRINT_REQUEST : in MESSAGE; RECEIVE_FILE : in MESSAGE;
    FILE : out PATH; REQUEST_FILE : out MESSAGE;
    SCREEN_PARAM : out PARAM);

end CHECK_FOR_FILE_PKG;

package body CHECK_FOR_FILE_PKG is

  procedure CHECK_FOR_FILE(PRINT_REQUEST : in MESSAGE; RECEIVE_FILE : in MESSAGE;
    FILE : out PATH; REQUEST_FILE : out MESSAGE;
    SCREEN_PARAM : out PARAM) is
    begin
      Put_Line(Item => "Inside operator CHECK_FOR_FILE");
    end CHECK_FOR_FILE;

  end CHECK_FOR_FILE_PKG;
```

```

--filename: SAAWC_client_thread_manager.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package tracks and handles all messages from clients

with text_io;use text_io;
with ALERT_PKG;use ALERT_PKG;
with DB_RECORD_PKG;use DB_RECORD_PKG;
with MAP_PKG;use MAP_PKG;
with MESSAGE_PKG;use MESSAGE_PKG;
with TRACKS_PKG;use TRACKS_PKG;
with CERTIFICATE_PKG;use CERTIFICATE_PKG;
with KEY_PKG;use KEY_PKG;
with SIGNATURE_PKG;use SIGNATURE_PKG;

package CLIENT_THREAD_MANAGER_PKG is

  procedure CLIENT_THREAD_MANAGER(AD_SUB_ALERTS : in ALERT; AD_SUB_DATA : in DB_RECORD;
    AD_SUB_MAP : in MAP; AD_SUB_MSGS : in MESSAGE;
    AD_SUB_TRACKS : in TRACKS; PRINT_REQ : in MESSAGE;
    REQ_CERTIFICATE : in CERTIFICATE; REQ_KEY : in KEY;
    REQ_SIGNATURE : in SIGNATURE; SECURE_MSG_OUT : in MES
    SAGE;
    ALERT;
    SAGE;
    FICATE;
    PRINT_RESPONSE : out MESSAGE);

  end CLIENT_THREAD_MANAGER_PKG;

package body CLIENT_THREAD_MANAGER_PKG is

  procedure CLIENT_THREAD_MANAGER(AD_SUB_ALERTS : in ALERT; AD_SUB_DATA : in DB_RECORD;
    AD_SUB_MAP : in MAP; AD_SUB_MSGS : in MESSAGE;
    AD_SUB_TRACKS : in TRACKS; PRINT_REQ : in MESSAGE;
    REQ_CERTIFICATE : in CERTIFICATE; REQ_KEY : in KEY;
    REQ_SIGNATURE : in SIGNATURE; SECURE_MSG_OUT : in MES
    SAGE;
    ALERT;
    SAGE;
    FICATE;
    PRINT_RESPONSE : out MESSAGE) is
    begin
      Put_Line(Item => "Inside operator CLIENT_THREAD_MANAGER");
    end CLIENT_THREAD_MANAGER;

  end CLIENT_THREAD_MANAGER_PKG;

```

```
--filename: SAAWC.correl_handle_query.a
--
--Author: Capt Malt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package determines if a requested track is a valid one

with text_io;use text_io;
with TRACKS_PKG;use TRACKS_PKG;

package CORREL_HANDLE_QUERY_PKG is

  procedure CORREL_HANDLE_QUERY(CORREL_FILTER : in TRACKS; VALID_TRACKS : in TRACKS;
                                RESPOND_VALID_TRACKS : out TRACKS);

end CORREL_HANDLE_QUERY_PKG;

package body CORREL_HANDLE_QUERY_PKG is

  procedure CORREL_HANDLE_QUERY(CORREL_FILTER : in TRACKS; VALID_TRACKS : in TRACKS;
                                RESPOND_VALID_TRACKS : out TRACKS) is
    begin
      put_line(Item => "Inside operator CORREL_HANDLE_QUERY");
    end CORREL_HANDLE_QUERY;
  end CORREL_HANDLE_QUERY_PKG;
```

```

--filename: SAAMC.correl_update_filter.a
--
--Author: Capt Malt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package updates the filter request database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;
with TRACKS_PKG;use TRACKS_PKG;

package CORREL_UPDATE_FILTER_PKG is

  procedure CORREL_UPDATE_FILTER(REQUEST_TRACKS : in TRACKS; CORREL_FILTER : out TRACKS
  ;
  SUBSCRIBE_DB_CHANGES : out DB_RECORD;
  SUBSCRIBE_TRACKS : out TRACKS);

end CORREL_UPDATE_FILTER_PKG;

package body CORREL_UPDATE_FILTER_PKG is

  procedure CORREL_UPDATE_FILTER(REQUEST_TRACKS : in TRACKS; CORREL_FILTER : out TRACKS
  ;
  SUBSCRIBE_DB_CHANGES : out DB_RECORD;
  SUBSCRIBE_TRACKS : out TRACKS) is

    begin

      Put_Line(Item => "Inside operator CORREL_UPDATE_FILTER");

    end CORREL_UPDATE_FILTER;

  end CORREL_UPDATE_FILTER_PKG;

```

```
--filename: SAAWC.correl_update_tracks.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package updates the incoming tracks database

with text_io;use text_io;
with TRACKS_PKG;use TRACKS_PKG;

package CORREL_UPDATE_TRACKS_PKG is

  procedure CORREL_UPDATE_TRACKS(CS_DEL_TRACKS : in TRACKS; CORREL_TRACK_DB : out TRACK
S);
end CORREL_UPDATE_TRACKS_PKG;

package body CORREL_UPDATE_TRACKS_PKG is

  procedure CORREL_UPDATE_TRACKS(CS_DEL_TRACKS : in TRACKS; CORREL_TRACK_DB : out TRACK
S) is
begin
  Put_Line(Item => "Inside operator CORREL_UPDATE_TRACKS");
end CORREL_UPDATE_TRACKS;

end CORREL_UPDATE_TRACKS_PKG;
```

```

--Filename: SAAWC.correlate_tracks.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package correlates tracks to database records

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;
with TRACKS_PKG;use TRACKS_PKG;

package CORRELATE_TRACKS_PKG is

  procedure CORRELATE_TRACKS(CORREL_RECORD_DB : in DB_RECORD; CORREL_TRACK_DB : in TRAC
KS;
                           VALID_TRACKS : out TRACKS);

  end CORRELATE_TRACKS_PKG;

package body CORRELATE_TRACKS_PKG is

  procedure CORRELATE_TRACKS(CORREL_RECORD_DB : in DB_RECORD; CORREL_TRACK_DB : in TRAC
KS;
                           VALID_TRACKS : out TRACKS) is

    begin

      put_line(item => "Inside operator CORRELATE_TRACKS");

    end CORRELATE_TRACKS;

  end CORRELATE_TRACKS_PKG;

```

```
--filename: SAAWC_data_display_db.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package tracks database requests and displays results

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package DATA_DISPLAY_DB_PKG is

  procedure DATA_DISPLAY_DB(AD_DEL_DATA : in DB_RECORD; AD_SUB_DATA : out DB_RECORD;
    FILTER_DATA : in DB_RECORD);

end DATA_DISPLAY_DB_PKG;

package body DATA_DISPLAY_DB_PKG is

  procedure DATA_DISPLAY_DB(AD_DEL_DATA : in DB_RECORD; AD_SUB_DATA : out DB_RECORD;
    FILTER_DATA : in DB_RECORD) is
    begin
      put_line(item => "Inside operator DATA_DISPLAY_DB");
    end DATA_DISPLAY_DB;

  end DATA_DISPLAY_DB_PKG;
```



```

--filename: SAAWC.DB_RECORD.A
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose:

--This file is where I declare the type DB_RECORD

with text_io;use text_io;
with timestamp_pkg;use timestamp_pkg;

package DB_RECORD_PKG is
package nat_io_pkg is new text_io.integer_io(natural);

type db_record_type is (AIR, SURFACE, SUBSURFACE, SPACE, GROUND, UNK_RECORD);
package db_record_io is new text_io.enumeration_io(db_record_type);

subtype lat_type is natural range 0..999999;
subtype long_type is natural range 0..999999;

type status_type is (FRIEND, HOSTILE, UNK_STATUS);
package status_io is new text_io.enumeration_io(status_type);

type model_type is (FA18, FA14, AV8B, CH46, CH53, UH1, UNK_MODEL);
package model_io is new text_io.enumeration_io(model_type);

type DB_RECORD;
type DB_RECORD_ACCESS is access DB_RECORD;

type DB_RECORD is record
  db_record_id : Natural := 0;
  this_db_record : db_record_type := UNK_RECORD;
  report_source : String(1..10) := " ";
  lat : lat_type := 0;
  long : long_type := 0;
  unit : String(1..15) := " ";
  status : status_type := UNK_STATUS;
  model : model_type := UNK_MODEL;
  report_date : Natural := 0;
  next : DB_RECORD_ACCESS := NULL;
  request : Boolean := True;
end record;

function EMPTY return DB_RECORD;

end DB_RECORD_PKG;

package body DB_RECORD_PKG is
function EMPTY return DB_RECORD is
  dummy : DB_RECORD;
begin
  return dummy;
end EMPTY;

end DB_RECORD_PKG;

```

```
--filename: SAAMC.delete_file.a
--
--Author: Capt Malt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This Package deletes DB_RECORDS types from database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package DELETE_FILE_PKG is

procedure DELETE_FILE(REQ_DEL_FILE : in DB_RECORD; FILE_DEL_DB : out DB_RECORD);

end DELETE_FILE_PKG;

package body DELETE_FILE_PKG is

procedure DELETE_FILE (REQ_DEL_FILE : in DB_RECORD; FILE_DEL_DB : out DB_RECORD) is
begin
    Put_Line(Item => "Inside Operator DELETE FILE");
end DELETE_FILE;

end DELETE_FILE_PKG;
```

```

--filename: SAAMC.delete_object.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package deletes DB_RECORDS types from database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package DELETE_OBJECT_PKG is

  procedure DELETE_OBJECT(REQ_DEL_OBJ : in DB_RECORD; OBJ_DEL_DB : out DB_RECORD);
end DELETE_OBJECT_PKG;

package body DELETE_OBJECT_PKG is

  procedure DELETE_OBJECT (REQ_DEL_OBJ : in DB_RECORD; OBJ_DEL_DB : out DB_RECORD) is
  begin
    put_line(Item => "Inside operator DELETE OBJECT");
  end DELETE_OBJECT;

end DELETE_OBJECT_PKG;

```

```
--filename: SAAWC.delete_record.a
--
--Author: Capt Malt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package deletes DB_RECORDS types from database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package DELETE_RECORD_PKG is

  procedure DELETE_RECORD(REQ_DEL_REC : in DB_RECORD; REC_DEL_DB : out DB_RECORD);

end DELETE_RECORD_PKG;

package body DELETE_RECORD_PKG is

  procedure DELETE_RECORD (REQ_DEL_REC : in DB_RECORD; REC_DEL_DB : out DB_RECORD) is
  begin
    Put_line(Item => "Inside operator DELETE_RECORD");
  end DELETE_RECORD;

end DELETE_RECORD_PKG;
```

```

--filename: SAAWC.device.a
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose:

--This file is where I declare the type DEVICE

with text_io;
use text_io;
with file_name_pkg;
use file_name_pkg;

package DEVICE_PKG is

type DEVICE is record

    device_name : file_name;

end record;

function EMPTY return DEVICE;

end DEVICE_PKG;

package body DEVICE_PKG is

    function EMPTY return DEVICE is

        dummy : DEVICE;

    begin

        dummy.device_name := (OTHERS => ' ');
        return dummy;

    end EMPTY;

end DEVICE_PKG;

```

SAAWC.file\_name.a

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```
--File: SAAWC.file_name.a
--
--Author: Capt Matt Howell
--Date: 14 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: To declare file_name type

with text_io;
use text_io;

package file_name_PKG is

    subtype file_name is String(1..256);

end file_name_PKG;
```

```

--filename: SAAWC.format_response.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package prepares a response to a particular database request

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;
with MESSAGE_PKG;use MESSAGE_PKG;

package FORMAT_RESPONSE_PKG is

  procedure FORMAT_RESPONSE(FILE_ADD_DB : in DB_RECORD; FILE_DEL_DB : in DB_RECORD;
    FILE_MOD_DB : in DB_RECORD; FILE_RETR_MSG : in DB_RECORD;
    OBJ_ADD_DB : in DB_RECORD; OBJ_DEL_DB : in DB_RECORD;
    OBJ_MOD_DB : in DB_RECORD; OBJ_RETR_MSG : in DB_RECORD;
    REC_ADD_DB : in DB_RECORD; REC_DEL_DB : in DB_RECORD;
    REC_MOD_DB : in DB_RECORD; REC_RETR_MSG : in DB_RECORD;
    RESPOND_MSG : out MESSAGE);

end FORMAT_RESPONSE_PKG;

package body FORMAT_RESPONSE_PKG is

  procedure FORMAT_RESPONSE(FILE_ADD_DB : in DB_RECORD; FILE_DEL_DB : in DB_RECORD;
    FILE_MOD_DB : in DB_RECORD; FILE_RETR_MSG : in DB_RECORD;
    OBJ_ADD_DB : in DB_RECORD; OBJ_DEL_DB : in DB_RECORD;
    OBJ_MOD_DB : in DB_RECORD; OBJ_RETR_MSG : in DB_RECORD;
    REC_ADD_DB : in DB_RECORD; REC_DEL_DB : in DB_RECORD;
    REC_MOD_DB : in DB_RECORD; REC_RETR_MSG : in DB_RECORD;
    RESPOND_MSG : out MESSAGE) is

begin

  Put_Line(Item => "Inside operator FORMAT_RESPONSE");

end FORMAT_RESPONSE;

end FORMAT_RESPONSE_PKG;

```

```
--filename: SAAWC.ftp_processor_in.a
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package processes incoming FTP messages

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package FTP_PROCESSOR_IN_PKG is

  procedure FTP_PROCESSOR_IN(FTP_IN : in MESSAGE; FTP_MSG_IN : out MESSAGE);

end FTP_PROCESSOR_IN_PKG;

package body FTP_PROCESSOR_IN_PKG is

  procedure FTP_PROCESSOR_IN (FTP_IN : in MESSAGE; FTP_MSG_IN : out MESSAGE) is
  begin
    Put_Line(Item => "Inside operator FTP_PROCESSOR_IN ");
  end FTP_PROCESSOR_IN;

end FTP_PROCESSOR_IN_PKG;
```



```

--filename: SAAMC.ftp_processor.out.a
--
--Author: Capt Matt Howell
--Date: 17 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package processes outgoing FTP messages

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package FTP_PROCESSOR_OUT_PKG is

  procedure FTP_PROCESSOR_OUT(FTP_Msg_OUT : in MESSAGE; FTP_OUT : out MESSAGE);

end FTP_PROCESSOR_OUT_PKG;

package body FTP_PROCESSOR_OUT_PKG is

  procedure FTP_PROCESSOR_OUT (FTP_Msg_OUT : in MESSAGE; FTP_OUT : out MESSAGE) is
  begin

    Put_Line(Item => "Inside operator FTP_PROCESSOR_OUT");

  end FTP_PROCESSOR_OUT;

end FTP_PROCESSOR_OUT_PKG;

```

```
--filename: SAAWC.get_user_cmd.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package receives and processes commands from the user

with text_io;use text_io;
with ALERT_PKG;use ALERT_PKG;
with DB_RECORD_PKG;use DB_RECORD_PKG;
with MAP_PKG;use MAP_PKG;
with MESSAGE_PKG;use MESSAGE_PKG;
with TRACKS_PKG;use TRACKS_PKG;
with ADMINISTER_PKG;use ADMINISTER_PKG;

package GET_USER_CMD_PKG is

  procedure GET_USER_CMD(DATA_OUT : out MESSAGE; FILTER_ALERTS : out ALERT;
    FILTER_DATA : out DB_RECORD; FILTER_MAPS : out MAP;
    FILTER_MSGS : out MESSAGE; FILTER_TRACKS : out TRACKS;
    MOD_OBJ_LOC : out ADMINISTER; MOD_RULES : out ADMINISTER;
    PRINT_FILE : out MESSAGE; REQ_SECURE_SESSION : out MESSAGE);

end GET_USER_CMD_PKG;

package body GET_USER_CMD_PKG is

  procedure GET_USER_CMD(DATA_OUT : out MESSAGE; FILTER_ALERTS : out ALERT;
    FILTER_DATA : out DB_RECORD; FILTER_MAPS : out MAP;
    FILTER_MSGS : out MESSAGE; FILTER_TRACKS : out TRACKS;
    MOD_OBJ_LOC : out ADMINISTER; MOD_RULES : out ADMINISTER;
    PRINT_FILE : out MESSAGE; REQ_SECURE_SESSION : out MESSAGE) is

    begin

      Put_Line(Item => "Inside operator GET_USER_CMD");

    end GET_USER_CMD;

end GET_USER_CMD_PKG;
```

```

--filename: SAAWC.handle_query.a
--
--Author: Carl Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package receives filter requests and responds with track if it exists

with text_io; use text_io;
with TRACKS_PKG; use TRACKS_PKG;

package HANDLE_QUERY_PKG is

    procedure HANDLE_QUERY(FILTER : in TRACKS; TRACK_DB : in TRACKS;
                           RESPOND_TRACKS : out TRACKS);

end HANDLE_QUERY_PKG;

package body HANDLE_QUERY_PKG is

    procedure HANDLE_QUERY(FILTER : in TRACKS; TRACK_DB : in TRACKS;
                           RESPOND_TRACKS : out TRACKS) is
    begin
        Put_line(Item => "Inside operator HANDLE_QUERY");
    end HANDLE_QUERY;

end HANDLE_QUERY_PKG;

```

```
--filename: SAAMC.http_processor_in.a
--Author: Capt Malt Howell
--Date: 17 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package processes incoming HTTP messages

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package HTTP_PROCESSOR_IN_PKG is

  procedure HTTP_PROCESSOR_IN(HTTP_IN : in MESSAGE; HTTP_MSG_IN : out MESSAGE);

end HTTP_PROCESSOR_IN_PKG;

package body HTTP_PROCESSOR_IN_PKG is

  procedure HTTP_PROCESSOR_IN (HTTP_IN : in MESSAGE; HTTP_MSG_IN : out MESSAGE) is
  begin
    Put_Line(Item => "Inside operator HTTP_PROCESSOR_IN");
  end HTTP_PROCESSOR_IN;

end HTTP_PROCESSOR_IN_PKG;
```

```

--filename: SAAMC.http_processor_out.a
--
--Author: Capt Matt Howell
--Date: 17 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package processes outgoing HTTP messages

with text_io; use text_io;
with MESSAGE_PKG; use MESSAGE_PKG;

package HTTP_PROCESSOR_OUT_PKG is

  procedure HTTP_PROCESSOR_OUT(HTTP_MSG_OUT : in MESSAGE; HTTP_OUT : out MESSAGE);

end HTTP_PROCESSOR_OUT_PKG;

package body HTTP_PROCESSOR_OUT_PKG is

  procedure HTTP_PROCESSOR_OUT (HTTP_MSG_OUT : in MESSAGE; HTTP_OUT : out MESSAGE) is
  begin
    Put_Line(Item => "Inside operator HTTP_PROCESSOR_OUT");
  end HTTP_PROCESSOR_OUT;

end HTTP_PROCESSOR_OUT_PKG;

```

```
--filename: SAAWC.Key.a
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose:

--This file is where I declare the type KEY

with text_io;
use text_io;
with file_name_pkg;
use file_name_pkg;

package KEY_PKG is

type KEY is record

    key_name : file_name;
    request : Boolean := True;

end record;

function EMPTY return KEY;

end KEY_PKG;

package body KEY_PKG is

function EMPTY return KEY is

    dummy : KEY;

begin

    dummy.key_name := (OTHERS => ' ');

    return dummy;

end EMPTY;

end KEY_PKG;
```

```

--filename: SAAWC.locate_map.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package receives a map request and delivers the response

with text_io;use text_io;
with MAP_PKG;use MAP_PKG;

package LOCATE_MAP_PKG is

    procedure LOCATE_MAP(REQUEST_MAP : in MAP; DELIVER_MAP : out MAP);

end LOCATE_MAP_PKG;

package body LOCATE_MAP_PKG is

    procedure LOCATE_MAP(REQUEST_MAP : in MAP; DELIVER_MAP : out MAP) is
    begin

        Put_line(Item => "Inside operator LOCATE_MAP");

    end LOCATE_MAP;

end LOCATE_MAP_PKG;

```

```
--filename: SAAWC.map.a
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose:

-- This file is where I declare the type MAP

with text_io;
use text_io;
with file_name_PKG;
use file_name_PKG;

package MAP_PKG is

type MAP is record

  map_name : file_name;
  request : Boolean := True;

end record;

function EMPTY return MAP;

end MAP_PKG;

package body MAP_PKG is

function EMPTY return MAP is

  dummy : MAP;

begin

  dummy.map_name := (OTHERS => ' ');
  return dummy;

end EMPTY;

end MAP_PKG;
```



```

--filename: SAAWC.map_display_db.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package tracks map requests and displays results

with text_io;use text_io;
with MAP_PKG;use MAP_PKG;

package MAP_DISPLAY_DB_PKG is

  procedure MAP_DISPLAY_DB(AD_DEL_MAP : in MAP; AD_SUB_MAP : out MAP;
    FILTER_MAPS : in MAP);

end MAP_DISPLAY_DB_PKG;

package body MAP_DISPLAY_DB_PKG is

  procedure MAP_DISPLAY_DB(AD_DEL_MAP : in MAP; AD_SUB_MAP : out MAP;
    FILTER_MAPS : in MAP) is
    begin
      Put_Line(Item => "Inside operator MAP_DISPLAY_DB");
    end MAP_DISPLAY_DB;
  end MAP_DISPLAY_DB_PKG;

```



```

--filename: SAAMC.mod_file.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package modifies DB_RECORDS types in database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package MOD_FILE_PKG is

  procedure MOD_FILE(REQ_MOD_FILE : in DB_RECORD; FILE_MOD_DB : out DB_RECORD);

end MOD_FILE_PKG;

package body MOD_FILE_PKG is

  procedure MOD_FILE (REQ_MOD_FILE : in DB_RECORD; FILE_MOD_DB : out DB_RECORD) is
  begin

    Put_Line(Item => "Inside operator MOD FILE");

  end MOD_FILE;

end MOD_FILE_PKG;

```

```
--filename: SAAWC.mod_object.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package modifies DB_RECORDS types in database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package MOD_OBJECT_PKG is

  procedure MOD_OBJECT(REQ_MOD_OBJ : in DB_RECORD; OBJ_MOD_DB : out DB_RECORD);

end MOD_OBJECT_PKG;

package body MOD_OBJECT_PKG is

  procedure MOD_OBJECT (REQ_MOD_OBJ : in DB_RECORD; OBJ_MOD_DB : out DB_RECORD) is
  begin

    Put_Line(Item => "Inside operator MOD OBJECT");

  end MOD_OBJECT;

end MOD_OBJECT_PKG;
```

```

--filename: SAAWC.mod_record.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package modifies DB_RECORDS types in database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package MOD_RECORD_PKG is

  procedure MOD_RECORD(REQ_MOD_REC : in DB_RECORD; REC_MOD_DB : out DB_RECORD);
end MOD_RECORD_PKG;

package body MOD_RECORD_PKG is

  procedure MOD_RECORD(REQ_MOD_REC : in DB_RECORD; REC_MOD_DB : out DB_RECORD) is
  begin

    Put_Line(Item => "Inside operator MOD_RECORD");

  end MOD_RECORD;

end MOD_RECORD_PKG;

```

```
--filename: SAAWC.mount_device.a
""
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package tracks the mounting and unmounting of devices

with text_io;use text_io;
with DEVICE_PKG;use DEVICE_PKG;

package MOUNT_DEVICE_PKG is

  procedure MOUNT_DEVICE(ADMINISTER_DEVICE : in DEVICE; DEVICE_STATUS : out BOOLEAN);

end MOUNT_DEVICE_PKG;

package body MOUNT_DEVICE_PKG is

  procedure MOUNT_DEVICE(ADMINISTER_DEVICE : in DEVICE; DEVICE_STATUS : out BOOLEAN) is
  begin
    Put_line(Item => "Inside operator MOUNT_DEVICE");
  end MOUNT_DEVICE;

end MOUNT_DEVICE_PKG;
```

```

--Filename: SAAMC_msg_display.ad.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package tracks message requests and displays results

with text_io; use text_io;
with MESSAGE_PKG; use MESSAGE_PKG;

package MSG_DISPLAY_DB_PKG is

  procedure MSG_DISPLAY_DB(AD_DEL_MSGS : in MESSAGE; AD_SUB_MSGS : out MESSAGE;
                           FILTER_MSGS : in MESSAGE);

end MSG_DISPLAY_DB_PKG;

package body MSG_DISPLAY_DB_PKG is

  procedure MSG_DISPLAY_DB(AD_DEL_MSGS : in MESSAGE; AD_SUB_MSGS : out MESSAGE;
                           FILTER_MSGS : in MESSAGE) is
  begin
    Put_Line(Item => "Inside operator MSG_DISPLAY_DB");
  end MSG_DISPLAY_DB;

end MSG_DISPLAY_DB_PKG;

```

```
--filename: SAAWC.msg_handle_query.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package determines if a requested message is in the database

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package MSG_HANDLE_QUERY_PKG is

  procedure MSG_HANDLE_QUERY(MSG_FILTER : in MESSAGE; MSG_MESSAGE_DB : in MESSAGE;
    RESPOND_MSGS : out MESSAGE);

end MSG_HANDLE_QUERY_PKG;

package body MSG_HANDLE_QUERY_PKG is

  procedure MSG_HANDLE_QUERY(MSG_FILTER : in MESSAGE; MSG_MESSAGE_DB : in MESSAGE;
    RESPOND_MSGS : out MESSAGE) is
    begin
      Put_Line(Item => "Inside operator MSG_HANDLE_QUERY");
    end MSG_HANDLE_QUERY;
  end MSG_HANDLE_QUERY_PKG;
```



```

--filename: SAAMC_msg_out_manager.a
--
--Author: Capt Malt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package puts user input into an appropriate message format

with text_io; use text_io;
with MESSAGE_PKG; use MESSAGE_PKG;

package MSG_OUT_MANAGER_PKG is

  procedure MSG_OUT_MANAGER(DATA_OUT : in MESSAGE; MSG_OUT : out MESSAGE);

end MSG_OUT_MANAGER_PKG;

package body MSG_OUT_MANAGER_PKG is

  procedure MSG_OUT_MANAGER(DATA_OUT : in MESSAGE; MSG_OUT : out MESSAGE) is
  begin
    Put_line(Item => "Inside operator MSG_OUT_MANAGER");
  end MSG_OUT_MANAGER;

end MSG_OUT_MANAGER_PKG;

```

```
--filename: SAAWC.msg_update_filter.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package tracks message filter requests

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package MSG_UPDATE_FILTER_PKG is

  procedure MSG_UPDATE_FILTER(REQUEST_MSGS : in MESSAGE; MSG_FILTER : out MESSAGE);

end MSG_UPDATE_FILTER_PKG;

package body MSG_UPDATE_FILTER_PKG is

  procedure MSG_UPDATE_FILTER(REQUEST_MSGS : in MESSAGE; MSG_FILTER : out MESSAGE) is
  begin
    Put_line(Item => "Inside operator MSG_UPDATE_FILTER");
  end MSG_UPDATE_FILTER;

end MSG_UPDATE_FILTER_PKG;
```

```

--Filename: SAAMC.network.a
--
--Author: Capt Malt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package produces incoming messages and processes outgoing messages

with text_io; use text_io;
with BITS_PKG; use BITS_PKG;

package NETWORK_PKG is

    procedure NETWORK(BITS_OUT : in BITS; BITS_IN : out BITS);

end NETWORK_PKG;

package body NETWORK_PKG is

    procedure NETWORK(BITS_OUT : in BITS; BITS_IN : out BITS) is
    begin
        Put_Line(Item => "Inside operator NETWORK");
    end NETWORK;

end NETWORK_PKG;

```

```
--filename: SAAMC.network_interface_in.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package processes messages coming off the network

with text_io;use text_io;
with BITS_PKG;use BITS_PKG;
with MESSAGE_PKG;use MESSAGE_PKG;

package NETWORK_INTERFACE_IN_PKG is

  procedure NETWORK_INTERFACE_IN(BITS_IN : in BITS; DATA_STR_IN : out MESSAGE);

end NETWORK_INTERFACE_IN_PKG;

package body NETWORK_INTERFACE_IN_PKG is

  procedure NETWORK_INTERFACE_IN(BITS_IN : in BITS; DATA_STR_IN : out MESSAGE) is
  begin
    Put_Line((1) : "Inside operator NETWORK_INTERFACE_IN");
  end NETWORK_INTERFACE_IN;

end NETWORK_INTERFACE_IN_PKG;
```

```

--Filename: SAAWC.network.interface_out.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package processes messages to be sent to the network

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;
with BITS_PKG;use BITS_PKG;

package NETWORK_INTERFACE_OUT_PKG is

  procedure NETWORK_INTERFACE_OUT(FTP_OUT : in MESSAGE; HTTP_OUT : in MESSAGE;
    SMTP_OUT : in MESSAGE; SNMP_OUT : in MESSAGE;
    UDP_OUT : in MESSAGE; BITS_OUT : out BITS);

end NETWORK_INTERFACE_OUT_PKG;

package body NETWORK_INTERFACE_OUT_PKG is

  procedure NETWORK_INTERFACE_OUT(FTP_OUT : in MESSAGE; HTTP_OUT : in MESSAGE;
    SMTP_OUT : in MESSAGE; SNMP_OUT : in MESSAGE;
    UDP_OUT : in MESSAGE; BITS_OUT : out BITS) is
  begin
    Put_Line(Item => "Inside operator NETWORK_INTERFACE_OUT");
  end NETWORK_INTERFACE_OUT;

end NETWORK_INTERFACE_OUT_PKG;

```

```
--filename: SAAMC.param.a
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose:

--This file is where I declare the type PARAM

with text_io;
use text_io;
with file_name_pkg;
use file_name_pkg;

package PARAM_PKG is

type PARAM is record

  param_name : file_name;
  request : Boolean := True;

end record;

function EMPTY return PARAM;

end PARAM_PKG;

package body PARAM_PKG is

function EMPTY return PARAM is

  dummy : PARAM;

begin

  dummy.param_name := (OTHERS => ' ');

  return dummy;

end EMPTY;

end PARAM_PKG;
```

```

--filename: SAWC.path.a
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAWC
--Purpose:

--This file is where I declare the type PATH

with text_io;
use text_io;
with file_name_pkg;
use file_name_pkg;

package PATH_PKG is
type PATH is record

    path_name : file_name;
    request : Boolean := True;

end record;

function EMPTY return PATH;

end PATH_PKG;

package body PATH_PKG is

    function EMPTY return PATH is

        dummy : PATH;

    begin

        dummy.path_name := (OTHERS => ' ');

        return dummy;

    end EMPTY;

end PATH_PKG;

```

```
--filename: SAAWC.print_manager.a
--
--Author: Capt Malt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package handles print requests from the user

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package PRINT_MANAGER_PKG is

  procedure PRINT_MANAGER(PRINT_FILE : in MESSAGE; PRINT_RESPONSE : in MESSAGE;
    PRINT_REQ : out MESSAGE);

end PRINT_MANAGER_PKG;

package body PRINT_MANAGER_PKG is

  procedure PRINT_MANAGER(PRINT_FILE : in MESSAGE; PRINT_RESPONSE : in MESSAGE;
    PRINT_REQ : out MESSAGE) is
    begin
      Put_Line(Item => "Inside operator PRINT_MANAGER");
    end PRINT_MANAGER;
  end PRINT_MANAGER_PKG;
```



```

--TitleName: SAAWC.Resolve_Alerts.d
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package tracks alert filters against the message database

With text_io;use text_io;
With ALERT_PKG;use ALERT_PKG;
With DB_RECORD_PKG;use DB_RECORD_PKG;
With TRACKS_PKG;use TRACKS_PKG;

package RESOLVE_ALERTS_PKG is

  procedure RESOLVE_ALERTS(ALERTS_FILTER : in TRACKS; ALERTS_MESSAGE_DB : in DB_RECORD;
    RESPOND_ALERTS : out ALERT);

end RESOLVE_ALERTS_PKG;

package body RESOLVE_ALERTS_PKG is

  procedure RESOLVE_ALERTS(ALERTS_FILTER : in TRACKS; ALERTS_MESSAGE_DB : in DB_RECORD;
    RESPOND_ALERTS : out ALERT) is
  begin
    Put_Line(Item => "Inside operator RESOLVE_ALERTS");
  end RESOLVE_ALERTS;

end RESOLVE_ALERTS_PKG;

```

```
--filename: SAAWC.resolve_data_type.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package determines which datatype the user has requested

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package RESOLVE_DATA_TYPE_PKG is

  procedure RESOLVE_DATA_TYPE(REQ_DATA : in DB_RECORD; REQ_DATA_TYPE : out DB_RECORD);

end RESOLVE_DATA_TYPE_PKG;

package body RESOLVE_DATA_TYPE_PKG is

  S  procedure RESOLVE_DATA_TYPE(REQ_DATA : in DB_RECORD; REQ_DATA_TYPE : out DB_RECORD) is
  begin
    Put_Line(item => "Inside operator RESOLVE_DATA_TYPE");
  end RESOLVE_DATA_TYPE;

end RESOLVE_DATA_TYPE_PKG;
```

```
--
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package determines what action the user wants to take on a database
```

```
with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;
```

package RESOLVE\_REQUEST\_TYPE\_PKG is

```

procedure*RESOLVE_REQUEST_TYPE : in DB_RECORD; REQ_ADD_FILE : out DB_RECORD;
CORD;

```

RD;

ORD;

ORD,

RD;  
BEC BEEM ETIE . 214 DE BECED. BEC BEEM CEI . 214 DE P

REC BETR REC : CUF DB RECORD) :

and RESOLVE...REQUEST\_1TYPE\_PKG;

package body RESOLVE\_REQUEST\_TYPE\_PKG is

```

PROCEDURE RESOLVE_REQUEST_TYPE (REQ_DATA_TYPE : IN DB_RECORD); REQ_ADD_FILE : OUT DB_RECORD;
CORD;

REQ_ADD_OPT OUT DB_RECORD; REQ_ADD_REQ OUT DB_RECORD;

```

RD;  
BEO DEL ETTE : OUT DB RECORD. BEO DEL OUT : OUT DB REC

REO DEL REC : out DB RECORD: REO MOD FILE : out DB REC

REQ\_MOD\_OBJ : out DB\_RECORD; REQ\_MOD\_REC : out DB\_REC

```
REQ_RETR_FILE : out DB_RECORD; REQ_RETR_OBJ : out DB_R
```

REQ\_RETR\_REC : out DB\_RECORD) is

begin

```
Put_Line(Item => "Inside operator RESOLVE_REQUEST_TYPE");
```

```
end RESOLVE_REQUEST_TYPE;
```

```
end RESOLVE_REQUEST_TYPE_PKG;
```

```
--filename: SAAWC.resolve_resource_loc.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package translates a requested resource into its physical location

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;
with ADMINISTER_PKG;use ADMINISTER_PKG;

package RESOLVE_RESOURCE_LOC_PKG is

  procedure RESOLVE_RESOURCE_LOC(REQ_RESOURCE : in MESSAGE; MOD_OBJ_LOC : in ADMINISTER
;
                                RESOURCE_PHYS_LOC : out MESSAGE);

end RESOLVE_RESOURCE_LOC_PKG;

package body RESOLVE_RESOURCE_LOC_PKG is

  procedure RESOLVE_RESOURCE_LOC(REQ_RESOURCE : in MESSAGE; MOD_OBJ_LOC : in ADMINISTER
;
                                RESOURCE_PHYS_LOC : out MESSAGE) is

    begin

      Put_Line(Item => "Inside operator RESOLVE_RESOURCE_LOC");
    end RESOLVE_RESOURCE_LOC;

end RESOLVE_RESOURCE_LOC_PKG;
```

```

--filename: SAAMC.retrieve_file.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package retrieves DB_RECORDS types from database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package RETRIEVE_FILE_PKG is

  procedure RETRIEVE_FILE(REQ_RETR_FILE : in DB_RECORD; FILE_RETR_MSG : out DB_RECORD);

end RETRIEVE_FILE_PKG;

package body RETRIEVE_FILE_PKG is

  is
    procedure RETRIEVE_FILE(REQ_RETR_FILE : in DB_RECORD; FILE_RETR_MSG : out DB_RECORD)
    is
      begin

        Put_Line(Item => "Inside operator RETRIEVE FILE");

      end RETRIEVE_FILE;

    end RETRIEVE_FILE_PKG;

```

```
--filename: SAAWC.retrieve_object.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package retrieves DB_RECORDS types from database

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package RETRIEVE_OBJECT_PKG is

  procedure RETRIEVE_OBJECT(REQ_RETR_OBJ : in DB_RECORD; OBJ_RETR_MSG : out DB_RECORD);

end RETRIEVE_OBJECT_PKG;

package body RETRIEVE_OBJECT_PKG is

  is
    procedure RETRIEVE_OBJECT(REQ_RETR_OBJ : in DB_RECORD; OBJ_RETR_MSG : out DB_RECORD)
    is
      begin
        Put_Line(Item => "Inside operator RETRIEVE_OBJECT");
      end RETRIEVE_OBJECT;
    end RETRIEVE_OBJECT_PKG;

end RETRIEVE_OBJECT_PKG;
```

```

--filename: SAAMC.retrieve_record.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package retrieves DB_RECORDS types from database

with text io;use text io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package RETRIEVE_RECORD_PKG is

  procedure RETRIEVE_RECORD(REQ_RETR_REC : in DB_RECORD, REC_RETR_MSG : out DB_RECORD);
end RETRIEVE_RECORD_PKG;

package body RETRIEVE_RECORD_PKG is

  is
    procedure RETRIEVE_RECORD(REQ_RETR_REC : in DB_RECORD, REC_RETR_MSG : out DB_RECORD)
    is
      begin
        Put_Line(Item => "Inside operator RETRIEVE_RECORD");
      end RETRIEVE_RECORD;
    end RETRIEVE_RECORD_PKG;

end RETRIEVE_RECORD_PKG;

```

```
--filename: SAAMC_security_manager.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package handles use of certificates, keys, signatures for user-
--         generated messages

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;
with CERTIFICATE_PKG;use CERTIFICATE_PKG;
with KEY_PKG;use KEY_PKG;
with SIGNATURE_PKG;use SIGNATURE_PKG;

package SECURITY_MANAGER_PKG is

  procedure SECURITY_MANAGER(MSG_OUT : in MESSAGE; REQ_SECURE_SESSION : in MESSAGE;
                             ISS_CERTIFICATE : in CERTIFICATE; ISS_KEY : in KEY;
                             ISS_SIGNATURE : in SIGNATURE; REQ_CERTIFICATE : out CERTIF
ICATE;
                             REQ_KEY : out KEY; REQ_SIGNATURE : out SIGNATURE;
                             SECURE_MSG_OUT : out MESSAGE);

end SECURITY_MANAGER_PKG;

package body SECURITY_MANAGER_PKG is

  procedure SECURITY_MANAGER(MSG_OUT : in MESSAGE; REQ_SECURE_SESSION : in MESSAGE;
                             ISS_CERTIFICATE : in CERTIFICATE; ISS_KEY : in KEY;
                             ISS_SIGNATURE : in SIGNATURE; REQ_CERTIFICATE : out CERTIF
ICATE;
                             REQ_KEY : out KEY; REQ_SIGNATURE : out SIGNATURE;
                             SECURE_MSG_OUT : out MESSAGE) is

    REQ_KEY : out KEY; REQ_SIGNATURE : out SIGNATURE;
    SECURE_MSG_OUT : out MESSAGE) is

      begin

        Put_Line(Item => "Inside operator SECURITY_MANAGER");

      end SECURITY_MANAGER;

    end SECURITY_MANAGER_PKG;
```



```

--llname: SAAMC.server_thread_manager.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package tracks communication between broker and servers

with text_io use text_io;
with ALERT_PKG use ALERT_PKG;
with DB_RECORD_PKG use DB_RECORD_PKG;
with MAP_PKG use MAP_PKG;
with MESSAGE_PKG use MESSAGE_PKG;
with TRACKS_PKG use TRACKS_PKG;
with CERTIFICATE_PKG use CERTIFICATE_PKG;
with KEY_PKG use KEY_PKG;
with SIGNATURE_PKG use SIGNATURE_PKG;
with TIMESTAMP_PKG use TIMESTAMP_PKG;
with DEVICE_PKG use DEVICE_PKG;

package SERVER_THREAD_MANAGER_PKG is

  procedure SERVER_THREAD_MANAGER(FTP_MSG_IN : in MESSAGE; HTTP_MSG_IN : in MESSAGE;
    SMTP_MSG_IN : in MESSAGE; SNMP_MSG_IN : in MESSAGE;
    UDP_MSG_IN : in MESSAGE; DELIVER_MAP : in MAP;
    DEVICE_STATUS : in BOOLEAN; ISSUE_CERTIFICATE : in CE
    ISSUE_KEY : in KEY; ISSUE_SIGNATURE : in SIGNATURE;
    JOB_SPOOLED_MSG : in MESSAGE; NEW_TIME : in TIMESTAMP
    REQUEST_FILE : in MESSAGE; RESOURCE_PHYS_LOC : in MES
    RESPOND_ALERTS : in ALERT; RESPOND_MSG : in MESSAGE;
    RESPOND_MSGS : in MESSAGE; RESPOND_TEMPLATE : in MESS
    RESPOND_TRACKS : in TRACKS; RESPOND_VALID_TRACKS : in
      SUBSCRIBE_DB_CHANGES : in DB_RECORD; SUBSCRIBE_TRACKS
      VALID_CLIENT_REQ : in MESSAGE; CS_DEL_TRACKS : out TR
      FEED_MSGS : out MESSAGE; ADMINISTER_DEVICE : out DEVI
      PRINT_REQUEST : out MESSAGE; RECEIVE_FILE : out MESSA
      REQ_ALERTS : out ALERT; REQ_DATA : out DB_RECORD;
      REQ_RESOURCE : out MESSAGE; REQ_TEMPLATE : out MESSAG
      REQ_TRACKS : out TRACKS; REQUEST_CERTIFICATE : out CE
      REQUEST_KEY : out KEY; REQUEST_MAP : out MAP;
      REQUEST_MSGS : out MESSAGE; REQUEST_SIGNATURE : out S
      REQUEST_TRACKS : out TRACKS; RESPOND_DB_CHANGE : out
      SESSION_CONTROL : out MESSAGE; SESSION_DATA : out MES
      SRV_RESPONSE : out MESSAGE);

end SERVER_THREAD_MANAGER_PKG;

package body SERVER_THREAD_MANAGER_PKG is

  procedure SERVER_THREAD_MANAGER(FTP_MSG_IN : in MESSAGE; HTTP_MSG_IN : in MESSAGE;
    SMTP_MSG_IN : in MESSAGE; SNMP_MSG_IN : in MESSAGE;
    UDP_MSG_IN : in MESSAGE; DELIVER_MAP : in MAP;
    DEVICE_STATUS : in BOOLEAN; ISSUE_CERTIFICATE : in CE
    ISSUE_KEY : in KEY; ISSUE_SIGNATURE : in SIGNATURE;
    JOB_SPOOLED_MSG : in MESSAGE; NEW_TIME : in TIMESTAMP
    REQUEST_FILE : in MESSAGE; RESOURCE_PHYS_LOC : in MES
    RESPOND_ALERTS : in ALERT; RESPOND_MSG : in MESSAGE;
    RESPOND_MSGS : in MESSAGE; RESPOND_TEMPLATE : in MESS
    RESPOND_TRACKS : in TRACKS; RESPOND_VALID_TRACKS : in
      SUBSCRIBE_DB_CHANGES : in DB_RECORD; SUBSCRIBE_TRACKS
      VALID_CLIENT_REQ : in MESSAGE; CS_DEL_TRACKS : out TR
      FEED_MSGS : out MESSAGE; ADMINISTER_DEVICE : out DEVI
      PRINT_REQUEST : out MESSAGE; RECEIVE_FILE : out MESSA
      REQ_ALERTS : out ALERT; REQ_DATA : out DB_RECORD;
      REQ_RESOURCE : out MESSAGE; REQ_TEMPLATE : out MESSAG
      REQ_TRACKS : out TRACKS; REQUEST_CERTIFICATE : out CE
      REQUEST_KEY : out KEY; REQUEST_MAP : out MAP;
      REQUEST_MSGS : out MESSAGE; REQUEST_SIGNATURE : out S
      REQUEST_TRACKS : out TRACKS; RESPOND_DB_CHANGE : out
      SESSION_CONTROL : out MESSAGE; SESSION_DATA : out MES
      SRV_RESPONSE : out MESSAGE) is
    begin
      Put_Line(Item => "Inside operator SERVER_THREAD_MANAGER");
    end SERVER_THREAD_MANAGER;

  end SERVER_THREAD_MANAGER_PKG;

```

```
--filename: SAAWC.session_manager.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package manages the operation of the different communication protocols

with text_io,use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package SESSION_MANAGER_PKG is

  procedure SESSION_MANAGER(DATA_STR_IN : in MESSAGE; SESSION_DATA : in MESSAGE;
    FTP_IN : out MESSAGE; FTP_MSG_OUT : out MESSAGE;
    HTTP_IN : out MESSAGE; HTTP_MSG_OUT : out MESSAGE;
    SMTP_IN : out MESSAGE; SMTP_MSG_OUT : out MESSAGE;
    SNMP_IN : out MESSAGE; SNMP_MSG_OUT : out MESSAGE;
    UDP_IN : out MESSAGE; UDP_MSG_OUT : out MESSAGE;
    SESSION_CONTROL : in MESSAGE);

end SESSION_MANAGER_PKG;

package body SESSION_MANAGER_PKG is

  procedure SESSION_MANAGER(DATA_STR_IN : in MESSAGE; SESSION_DATA : in MESSAGE;
    FTP_IN : out MESSAGE; FTP_MSG_OUT : out MESSAGE;
    HTTP_IN : out MESSAGE; HTTP_MSG_OUT : out MESSAGE;
    SMTP_IN : out MESSAGE; SMTP_MSG_OUT : out MESSAGE;
    SNMP_IN : out MESSAGE; SNMP_MSG_OUT : out MESSAGE;
    UDP_IN : out MESSAGE; UDP_MSG_OUT : out MESSAGE;
    SESSION_CONTROL : in MESSAGE) is

    begin

      put_line(item => "Inside operator SESSION_MANAGER");

    end SESSION_MANAGER;

  end SESSION_MANAGER_PKG;
```

```

--filename: saawc.signature.d
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose:

--This file is where I declare the type SIGNATURE

with text_io;
use text_io;
with file_name_pkg;
use file_name_pkg;

package SIGNATURE_PKG is

type SIGNATURE is record

  signature_name : file_name;
  request : Boolean := True;

end record;

function EMPTY return SIGNATURE;

end SIGNATURE_PKG;

package body SIGNATURE_PKG is

  function EMPTY return SIGNATURE is

    dummy : SIGNATURE;

  begin

    dummy.signature_name := (OTHERS => ' ');

    return dummy;

  end EMPTY;

end SIGNATURE_PKG;

```

```
--filename: SAAWC.smtp_processor_in.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package processes incoming SMTP messages

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package SMTP_PROCESSOR_IN_PKG is

  procedure SMTP_PROCESSOR_IN(SMTP_IN : in MESSAGE; SMTP_MSG_IN : out MESSAGE);

end SMTP_PROCESSOR_IN_PKG;

package body SMTP_PROCESSOR_IN_PKG is

  procedure SMTP_PROCESSOR_IN (SMTP_IN : in MESSAGE; SMTP_MSG_IN : out MESSAGE) is
  begin
    put_line(Item => "Inside operator SMTP_PROCESSOR_IN ");
  end SMTP_PROCESSOR_IN;

end SMTP_PROCESSOR_IN_PKG;
```

```

--filename: SAAMC.smtp_processor_out.a
--
--Author: Capt Matt Howell
--Date: 17 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package processes outgoing SMTP messages

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package SMTP_PROCESSOR_OUT_PKG is

  procedure SMTP_PROCESSOR_OUT(SMTP_MSG_OUT : in MESSAGE; SMTP_OUT : out MESSAGE);

end SMTP_PROCESSOR_OUT_PKG;

package body SMTP_PROCESSOR_OUT_PKG is

  procedure SMTP_PROCESSOR_OUT (SMTP_MSG_OUT : in MESSAGE; SMTP_OUT : out MESSAGE) is
  begin
    Put_Line(Item & "Inside operator SMTP PROCESSOR OUT");
  end SMTP_PROCESSOR_OUT;

end SMTP_PROCESSOR_OUT_PKG;

```

```
--filename: SAAWC.snmp_processor_in.a
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package processes incoming SNMP messages

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package SNMP_PROCESSOR_IN_PKG is

  procedure SNMP_PROCESSOR_IN(SNMP_IN : in MESSAGE; SNMP_MSG_IN : out MESSAGE);

end SNMP_PROCESSOR_IN_PKG;

package body SNMP_PROCESSOR_IN_PKG is

  procedure SNMP_PROCESSOR_IN (SNMP_IN : in MESSAGE; SNMP_MSG_IN : out MESSAGE) is
  begin

    Put_Line(Item => "Inside operator SNMP_PROCESSOR_IN");

  end SNMP_PROCESSOR_IN;

end SNMP_PROCESSOR_IN_PKG;
```

```

--Filename: SAAWC.snmp.processor_out.a
--
--Author: Capt Matt Howell
--Date: 17 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package processes outgoing SNMP messages

with text_io;use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package SNMP_PROCESSOR_OUT_PKG is

  procedure SNMP_PROCESSOR_OUT(SNMP_MSG_OUT : in MESSAGE; SNMP_OUT : out MESSAGE);

end SNMP_PROCESSOR_OUT_PKG;

package body SNMP_PROCESSOR_OUT_PKG is

  procedure SNMP_PROCESSOR_OUT (SNMP_MSG_OUT : in MESSAGE; SNMP_OUT : out MESSAGE) is
  begin
    Put_Line(Item => "Inside operator SNMP_PROCESSOR_OUT");
  end SNMP_PROCESSOR_OUT;

end SNMP_PROCESSOR_OUT_PKG;

```

```
--filename: SAAWC.spool_file.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package manages print jobs

with text_io;use text_io;
with PATH_PKG;use PATH_PKG;
with MESSAGE_PKG;use MESSAGE_PKG;

package SPOOL_FILE_PKG is

  procedure SPOOL_FILE(FILE : in PATH; FILE_NAME : in PATH; JOB_SPOOLED_MSG : out MESSA
GE);

end SPOOL_FILE_PKG;

package body SPOOL_FILE_PKG is

  procedure SPOOL_FILE(FILE : in PATH; FILE_NAME : in PATH; JOB_SPOOLED_MSG : out MESSA
GE) is
    begin
      Put_line(Item => "Inside operator SPOOL_FILE");
    end SPOOL_FILE;
  end SPOOL_FILE_PKG;
```



```

--Filename: saawc.tadil_j.a
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package processes TADIL J messages

with text_io;use text_io;
with TRACKS_PKG;use TRACKS_PKG;

package TADIL_J_PKG is

    procedure TADIL_J(FEED_TRACKS : out TRACKS);
end TADIL_J_PKG;

package body TADIL_J_PKG is

    procedure TADIL_J (FEED_TRACKS : out TRACKS) is
    begin
        Put_line(Item => "Inside operator TADIL J");
    end TADIL_J;
end TADIL_J_PKG;

```

```
--filename: SAAWC.template_database.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package delivers message templates to the user

with text_io,use text_io;
with MESSAGE_PKG;use MESSAGE_PKG;

package TEMPLATE_DATABASE_PKG is

    procedure TEMPLATE_DATABASE(REQ_TEMPLATE : in MESSAGE; RESPOND_TEMPLATE : out MESSAGE
    );
end TEMPLATE_DATABASE_PKG;

package body TEMPLATE_DATABASE_PKG is

    procedure TEMPLATE_DATABASE(REQ_TEMPLATE : in MESSAGE; RESPOND_TEMPLATE : out MESSAGE
    ) is
    begin
        put_line(item => "Inside operator TEMPLATE_DATABASE");
    end TEMPLATE_DATABASE;

end TEMPLATE_DATABASE_PKG;
```

```

--filename: SAAWC.timestamp.a
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose:

This file is where I declare the type TIMESTAMP

package TIMESTAMP_PKG is
    type TIMESTAMP is range 0..86400;
    function EMPTY return TIMESTAMP;
end TIMESTAMP_PKG;

package body TIMESTAMP_PKG is
    function EMPTY return TIMESTAMP is
        dummy : TIMESTAMP;
    begin
        dummy := 0;
        return dummy;
    end EMPTY;
end TIMESTAMP_PKG;

```

```
--filename: SAAWC.track_display_db.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package tracks track requests and displays results

with text_io;use text_io;
with TRACKS_PKG;use TRACKS_PKG;

package TRACK_DISPLAY_DB_PKG is

  procedure TRACK_DISPLAY_DB(AD_DEL_TRACKS : in TRACKS; AD_SUB_TRACKS : out TRACKS;
                             FILTER_TRACKS : in TRACKS);

end TRACK_DISPLAY_DB_PKG;

package body TRACK_DISPLAY_DB_PKG is

  procedure TRACK_DISPLAY_DB(AD_DEL_TRACKS : in TRACKS; AD_SUB_TRACKS : out TRACKS;
                             FILTER_TRACKS : in TRACKS) is
    begin
      Put_Line(Item => "Inside operator TRACK_DISPLAY_DB");
    end TRACK_DISPLAY_DB;
  end TRACK_DISPLAY_DB_PKG;
```

```

--filename: SAAWC.tracks.a
--
--Author: Capt Matt Howell
--Date: 12 Jun 97
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose:

--This file is where I declare the type TRACKS

with text_io;use text_io;
with TIMESTAMP_PKG;use TIMESTAMP_PKG;

package TRACKS_PKG is

package nat_io_pkg is new text_io.integer_io(natural);

type track_type is (AIR, SURFACE, SUBSURFACE, SPACE, GROUND, UNK_TRACK);
package track_io is new text_io.enumeration_io(track_type);

subtype lat_type is natural range 0..999999;
subtype long_type is natural range 0..999999;
subtype alt_type is natural range 0..999999;
subtype bearing_type is natural range 0..359;

type status_type is (FRIEND, HOSTILE, UNK_STATUS);
package status_io is new text_io.enumeration_io(status_type);

type model_type is (FA18, FA14, AV8B, CH46, CH53, UH1, UNK_MODEL);
package model_io is new text_io.enumeration_io(model_type);

type TRACKS;
type TRACKS_ACCESS is access TRACKS;

type TRACKS is record
  track_id : Natural := 0;
  track : track_type := UNK_TRACK;
  report_source : String(1..10) := " ";
  lat : lat_type := 0;
  long : long_type := 0;
  alt : alt_type := 0;
  bearing : bearing_type := 0;
  speed : Natural := 0;
  status : status_type := UNK_STATUS;
  model : model_type := UNK_MODEL;
  time : TIMESTAMP := 0;
  next : TRACKS_ACCESS := NULL;
  request : Boolean := True;
end record;

function EMPTY return TRACKS;

end TRACKS_PKG;

package body TRACKS_PKG is

function EMPTY return TRACKS is

  dummy : TRACKS;

begin

  return dummy;

end EMPTY;

```

end TRACKS\_PKG;

```
--filename: SAAWC_udp_processor_in.a
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package processes incoming UDP messages

with text_io; use text_io;
with MESSAGE_PKG; use MESSAGE_PKG;

package UDP_PROCESSOR_IN_PKG is

  procedure UDP_PROCESSOR_IN(UDP_IN : in MESSAGE; UDP_MSG_IN : out MESSAGE);

end UDP_PROCESSOR_IN_PKG;

package body UDP_PROCESSOR_IN_PKG is

  procedure UDP_PROCESSOR_IN (UDP_IN : in MESSAGE; UDP_MSG_IN : out MESSAGE) is
  begin
    Put_Line(Item => "Inside operator UDP_PROCESSOR_IN");
  end UDP_PROCESSOR_IN;

end UDP_PROCESSOR_IN_PKG;
```

```

--filename: SAAWC.udp_processor_out.a
--
--Author: Capt Matt Howell
--Date: 17 June 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package processes outgoing UDP messages

with text_io; use text_io;
with MESSAGE_PKG; use MESSAGE_PKG;

package UDP_PROCESSOR_OUT_PKG is

  procedure UDP_PROCESSOR_OUT(UDP_MSG_OUT : in MESSAGE; UDP_OUT : out MESSAGE);
end UDP_PROCESSOR_OUT_PKG;

package body UDP_PROCESSOR_OUT_PKG is

  procedure UDP_PROCESSOR_OUT(UDP_MSG_OUT : in MESSAGE; UDP_OUT : out MESSAGE) is
  begin
    put_line(11em => "Inside operator UDP_PROCESSOR_OUT");
  end UDP_PROCESSOR_OUT;

end UDP_PROCESSOR_OUT_PKG;

```

```
--filename: SAAMC.update_filter.a
--
--Author: Capt Malt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package tracks requested track filters

with text_io;use text_io;
with TRACKS_PKG;use TRACKS_PKG;

package UPDATE_FILTER_PKG is

  procedure UPDATE_FILTER(REQ_TRACKS : in TRACKS; FILTER : out TRACKS);

end UPDATE_FILTER_PKG;

package body UPDATE_FILTER_PKG is

  procedure UPDATE_FILTER(REQ_TRACKS : in TRACKS; FILTER : out TRACKS) is
  begin
    Put_Line(Item => "Inside operator UPDATE_FILTER");
  end UPDATE_FILTER;

end UPDATE_FILTER_PKG;
```



```

--filename: SAAWC_update_msgs.a
--
--Author: Capt Malt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package updates the message database for the alert server

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;
with MESSAGE_PKG;use MESSAGE_PKG;

package UPDATE_MSGS_PKG is

  procedure UPDATE_MSGS(FEED_MSGS : in MESSAGE; ALERTS_MESSAGE_DB : out DB_RECORD);
end UPDATE_MSGS_PKG;

package body UPDATE_MSGS_PKG is

  procedure UPDATE_MSGS(FEED_MSGS : in MESSAGE; ALERTS_MESSAGE_DB : out DB_RECORD) is
  begin
    Put_line(Item => "Inside operator UPDATE_MSGS");
    end UPDATE_MSGS;
end UPDATE_MSGS_PKG;

```

```
--filename: SAAWC.update_tactical_db.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package updates the record database for the correlation server

with text_io;use text_io;
with DB_RECORD_PKG;use DB_RECORD_PKG;

package UPDATE_TACTICAL_DB_PKG is

  procedure UPDATE_TACTICAL_DB(RESPOND_DB_CHANGE : in DB_RECORD; CORREL_RECORD_DB : out
    DB_RECORD) ;

end UPDATE_TACTICAL_DB_PKG;

package body UPDATE_TACTICAL_DB_PKG is

  procedure UPDATE_TACTICAL_DB(RESPOND_DB_CHANGE : in DB_RECORD; CORREL_RECORD_DB : out
    DB_RECORD) is
    begin
      Put_Line(Item => "Inside operator UPDATE_TACTICAL_DB");
    end UPDATE_TACTICAL_DB;
  end UPDATE_TACTICAL_DB_PKG;
```

```

--filename: SAAMC.update_time.2
--
--Author: Capt Matt Howell
--Date: 13 June 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package retrieves the system time

with Calendar;
with text_io; use text_io;
with TIMESTAMP_PKG; use TIMESTAMP_PKG;

package UPDATE_TIME_PKG is

  procedure UPDATE_TIME(NEW_TIME : out TIMESTAMP);

end UPDATE_TIME_PKG;

package body UPDATE_TIME_PKG is

  procedure UPDATE_TIME(NEW_TIME : out TIMESTAMP) is

    CurrentTime      : Ada.Calendar.Time;
    SecsPastMidnight : TIMESTAMP;
    MinsPastMidnight : natural;
    Secs             : natural;
    Mins             : natural;
    Hrs              : natural;

  begin

    Put_Line(Item => "Inside operator UPDATE_TIME");

    CurrentTime := Ada.Calendar.Clock;
    SecsPastMidnight := TIMESTAMP(Ada.Calendar.Seconds(CurrentTime));
    MinsPastMidnight := natural(SecsPastMidnight/60);
    Secs := natural(SecsPastMidnight REM 60);
    Mins := MinsPastMidnight REM 60;
    Hrs := MinsPastMidnight / 60;

    Ada.Text_IO.Put(Item => "The current time is ");
    Ada.Integer_Text_IO.Put(Item => Hrs, Width => 1);
    Ada.Text_IO.Put(Item => ':');

    if Mins < 10 then
      Ada.Text_IO.Put(Item => '0');
    end if;
    Ada.Integer_Text_IO.Put(Item => Mins, Width => 1);
    Ada.Text_IO.Put(Item => ':');

    if Secs < 10 then
      Ada.Text_IO.Put(Item => '0');
    end if;
    Ada.Integer_Text_IO.Put(Item => Secs, Width => 1);

    NEW_TIME := SecsPastMidnight;

  end UPDATE_TIME;

end UPDATE_TIME_PKG;

```

```
--filename: SAAWC.update_tracks.a
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAWC
--Purpose: This package updates the track database for the track server

with text_io;use text_io;
with TRACKS_PKG;use TRACKS_PKG;

package UPDATE_TRACKS_PKG is

  procedure UPDATE_TRACKS(FEED_TRACKS : in TRACKS; TRACK_DB : out TRACKS);

end UPDATE_TRACKS_PKG;

package body UPDATE_TRACKS_PKG is

  procedure UPDATE_TRACKS(FEED_TRACKS : in TRACKS; TRACK_DB : out TRACKS) is
  begin
    Put_line(Item => "Inside operator UPDATE_TRACKS");
  end UPDATE_TRACKS;

end UPDATE_TRACKS_PKG;
```

```

--filename: SAAMC.validate_certificate.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package manages certificates for the security server

with text_io; use text_io;
with CERTIFICATE_PKG; use CERTIFICATE_PKG;

package VALIDATE_CERTIFICATE_PKG is

  procedure VALIDATE_CERTIFICATE (REQUEST_CERTIFICATE: in CERTIFICATE;
                                   ISSUE_CERTIFICATE : out CERTIFICATE);

end VALIDATE_CERTIFICATE_PKG;

package body VALIDATE_CERTIFICATE_PKG is

  procedure VALIDATE_CERTIFICATE (REQUEST_CERTIFICATE: in CERTIFICATE;
                                   ISSUE_CERTIFICATE : out CERTIFICATE) is
  begin
    Put_Line(Item => "Inside operator VALIDATE_CERTIFICATE");
  end VALIDATE_CERTIFICATE;

end VALIDATE_CERTIFICATE_PKG;

```

```
--filename: SAAMC.validate_key.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package manages keys for the security server

with text_io;use text_io;
with KEY_PKG;use KEY_PKG;

package VALIDATE_KEY_PKG is

  procedure VALIDATE_KEY(REQUEST_KEY : in KEY; ISSUE_KEY : out KEY);
end VALIDATE_KEY_PKG;

package body VALIDATE_KEY_PKG is

  procedure VALIDATE_KEY(REQUEST_KEY : in KEY; ISSUE_KEY : out KEY) is
  begin
    Put_Line(Item => "Inside operator VALIDATE_KEY");
  end VALIDATE_KEY;
end VALIDATE_KEY_PKG;
```

```

--filename: SAAMC.validate_signature.a
--
--Author: Capt Matt Howell
--Date: 1 July 1997
--Project: Thesis - A CAPS Prototype of the SAAMC
--Purpose: This package manages signatures for the security server

with text_io;use text_io;
with SIGNATURE_PKG;use SIGNATURE_PKG;

package VALIDATE_SIGNATURE_PKG is

  procedure VALIDATE_SIGNATURE(REQUEST_SIGNATURE : in SIGNATURE; ISSUE_SIGNATURE : out
SIGNATURE);

end VALIDATE_SIGNATURE_PKG;

package body VALIDATE_SIGNATURE_PKG is

  procedure VALIDATE_SIGNATURE(REQUEST_SIGNATURE : in SIGNATURE; ISSUE_SIGNATURE : out
SIGNATURE) is

    begin

      Put_line(item => "Inside operator VALIDATE_SIGNATURE");

    end VALIDATE_SIGNATURE;

end VALIDATE_SIGNATURE_PKG;

```

## **APPENDIX B**

### **SAAWC MESSAGE SCHEDULE**



| TIME | MASTER                             | AIR DEF SYS DISPLAY         | BROKER                          |
|------|------------------------------------|-----------------------------|---------------------------------|
| 1    | new_time=970519080801              |                             |                                 |
| 2    | filter_tracks=tracks   want        | filter_tracks=tracks   want |                                 |
| 3    | ad_sub_tracks=tracks   want        | ad_sub_tracks=tracks   want |                                 |
| 4    | client_req=tracks   want           |                             | client_req=tracks   want        |
| 5    | valid_client_req=tracks   want     |                             | valid_client_req=tracks   want  |
| 6    | req_tracks=tracks   want           |                             | req_tracks=tracks   want        |
| 7    | request_tracks=tracks   want       |                             | request_tracks=tracks   want    |
| 8    | filter=tracks   want               |                             |                                 |
| 9    | respond_tracks=tracks   want       |                             |                                 |
| 10   | filter=tracks   want               |                             |                                 |
| 11   | new_time=970519080801              |                             |                                 |
| 12   | subscribe_tracks=tracks   want     |                             |                                 |
| 13   | subscribe_db_changes=tracks   want |                             |                                 |
| 14   | cs_del_tracks=tracks   want        |                             | cs_del_tracks=tracks   want     |
| 15   | track_db=tracks   want             |                             |                                 |
| 16   | req_data=tracks   want             |                             | req_data=tracks   want          |
| 17   | req_data_type=tracks   want        |                             |                                 |
| 18   | req_retr_rec=tracks   want         |                             |                                 |
| 19   | req_retr_msg=tracks   want         |                             |                                 |
| 20   | respond_msg=tracks   want          |                             |                                 |
| 21   | new_time=970519080801              |                             |                                 |
| 22   | respond_db_change=tracks   want    |                             | respond_db_change=tracks   want |
| 23   | record_db=tracks   want            |                             |                                 |
| 24   | valid_tracks=tracks   want         |                             |                                 |
| 25   | respond_valid_tracks=tracks   want |                             |                                 |
| 26   | manage_template=add_spot_rep_temp  |                             |                                 |
| 27   | sv_response=tracks   want          |                             | sv_response=tracks   want       |
| 28   | valid_sv_response=tracks   want    |                             | valid_sv_response=tracks   want |
| 29   | ad_del_tracks=tracks   want        |                             | ad_del_tracks=tracks   want     |
| 30   | feed_tracks=TADL_J_TRACKS          |                             |                                 |
| 31   | new_time=970519080801              |                             |                                 |
| 32   | filter_maps=map   want             | filter_maps=map   want      |                                 |
| 33   | ad_sub_map=map   want              | ad_sub_map=map   want       |                                 |
| 34   | client_req=map   want              |                             | client_req=map   want           |
| 35   | valid_client_req=map   want        |                             | valid_client_req=map   want     |
| 36   | req_map=map   want                 |                             | req_map=map   want              |

# SAAWC MESSAGE SCHEDULE

| TIME | MASTER                           | AIR DEF SYS DISPLAY         | BROKER                           |
|------|----------------------------------|-----------------------------|----------------------------------|
| 37   | manage_template=add_pos_rep_temp |                             |                                  |
| 38   | deliver_map=map   want           |                             |                                  |
| 39   | srv_response=map   want          |                             | srv_response=map   want          |
| 40   | valid_srv_response=map   want    |                             | valid_srv_response=map   want    |
| 41   | new_time=970519080841            |                             |                                  |
| 42   | ad_del_map=map   want            |                             | ad_del_map=map   want            |
| 43   | filter_alerts=alerts   want      | filter_alerts=alerts   want |                                  |
| 44   | ad_sub_alerts=alerts   want      | ad_sub_alerts=alerts   want |                                  |
| 45   | client_req=alerts   want         |                             | client_req=alerts   want         |
| 46   | valid_client_req=alerts   want   |                             | valid_client_req=alerts   want   |
| 47   | req_alerts=alerts   want         |                             | req_alerts=alerts   want         |
| 48   | filter=alerts   want             |                             |                                  |
| 49   | respond_alerts=alerts   want     |                             |                                  |
| 50   | srv_response=alerts   want       |                             | srv_response=alerts   want       |
| 51   | new_time=970519080851            |                             |                                  |
| 52   | valid_srv_response=alerts   want |                             | valid_srv_response=alerts   want |
| 53   | ad_del_alerts=alerts   want      |                             | ad_del_alerts=alerts   want      |
| 54   | filter_msgs=msgs   want          | filter_msgs=msgs   want     |                                  |
| 55   | ad_sub_msgs=msgs   want          | ad_sub_msgs=msgs   want     |                                  |
| 56   | client_req=msgs   want           |                             | client_req=msgs   want           |
| 57   | valid_client_req=msgs   want     |                             | valid_client_req=msgs   want     |
| 58   | request_msgs=msgs   want         |                             | request_msgs=msgs   want         |
| 59   | filter=msgs   want               |                             |                                  |
| 60   | respond_msgs=msgs   want         |                             |                                  |
| 61   | new_time=970519080901            |                             |                                  |
| 62   | srv_response=msgs   want         |                             | srv_response=msgs   want         |
| 63   | valid_srv_response=msgs   want   |                             | valid_srv_response=msgs   want   |
| 64   | ad_del_msgs=msgs   want          |                             | ad_del_msgs=msgs   want          |
| 65   | bits_in=http_bits_for_adsd       |                             |                                  |
| 66   | data=http_bits_for_adsd          |                             |                                  |
| 67   | HTTP_in=http_bits_for_adsd       |                             |                                  |
| 68   | HTTP_msg_in=http_bits_for_adsd   |                             |                                  |
| 69   | feed_msgs=http_bits_for_adsd     |                             | feed_msgs=http_bits_for_adsd     |
| 70   | message_db=http_bits_for_adsd    |                             |                                  |
| 71   | new_time=970519080911            |                             |                                  |
| 72   | respond_msgs=http_bits_for_adsd  |                             |                                  |

| TIME | MASTER                                  | AIR DEF SYS DISPLAY                  | BROKER                                  |
|------|---|--------------------------------------|---|
| 73   | svr_response=http_bits_for_adsd         |                                      | svr_response=http_bits_for_adsd         |
| 74   | valid_svr_response=http_bits_for_adsd   |                                      | valid_svr_response=http_bits_for_adsd   |
| 75   | ad_del_msgs=http_bits_for_adsd          |                                      | ad_del_msgs=http_bits_for_adsd          |
| 76   | install_device=new_cdrom_drive          |                                      | install_device=new_cdrom_drive          |
| 77   | device_alive=new_cdrom_drive            |                                      |   |
| 78   | print_file=file   want to print         | print_file=file   want to print      |   |
| 79   | print_req=file   want to print          | print_req=file   want to print       |   |
| 80   | client_req=file   want to print         |                                      | client_req=file   want to print         |
| 81   | new_time=970519080921                   |                                      |   |
| 82   | valid_client_req=file   want to print   |                                      | valid_client_req=file   want to print   |
| 83   | req_resource=file   want to print       |                                      | req_resource=file   want to print       |
| 84   | resource_phys_loc=file   want to print  |                                      |   |
| 85   | print_request=file   want to print      |                                      | print_request=file   want to print      |
| 86   | request_file=file   want to print       |                                      |   |
| 87   | req_data=file   want to print           |                                      | req_data=file   want to print           |
| 88   | req_data_type=file   want to print      |                                      |   |
| 89   | req_retr_file=file   want to print      |                                      |   |
| 90   | file_del_db=file   want to print        |                                      |   |
| 91   | new_time=970519080931                   |                                      |   |
| 92   | respond_msg=file   want to print        |                                      |   |
| 93   | receive_file=file   want to print       |                                      | receive_file=file   want to print       |
| 94   | file=file   want to print               |                                      |   |
| 95   | data_stream=file   want to print        |                                      |   |
| 96   | job_spooled_msg=file   want to print    |                                      |   |
| 97   | svr_response=file   want to print       |                                      | svr_response=file   want to print       |
| 98   | valid_svr_response=file   want to print |                                      | valid_svr_response=file   want to print |
| 99   | print_response=file   want to print     |                                      | print_response=file   want to print     |
| 100  | req_secure_session=my_secure_session    | req_secure_session=my_secure_session |   |
| 101  | new_time=970519080941                   |                                      |   |
| 102  | req_certificate=my_secure_session       | req_certificate=my_secure_session    |   |
| 103  | req_key=my_secure_session               | req_key=my_secure_session            |   |
| 104  | req_signature=my_secure_session         | req_signature=my_secure_session      |   |
| 105  | client_req=my_secure_session            |                                      | client_req=my_secure_session            |
| 106  | valid_client_req=my_secure_session      |                                      | valid_client_req=my_secure_session      |
| 107  | request_certificate=my_secure_session   |                                      | request_certificate=my_secure_session   |
| 108  | request_key=my_secure_session           |                                      | request_key=my_secure_session           |

# SAWC MESSAGE SCHEDULE

| TIME | MASTER                               | AIR DEF SYS DISPLAY | BROKER                               |
|------|--------------------------------------|---------------------|--------------------------------------|
| 109  | request_signature=my_secure_session  |                     | request_signature=my_secure_session  |
| 110  | issue_certificate=my_secure_session  |                     |                                      |
| 111  | new_time=970519080951                |                     |                                      |
| 112  | issue_key=my_secure_session          |                     |                                      |
| 113  | issue_signature=my_secure_session    |                     |                                      |
| 114  | srv_response=my_secure_session       |                     | srv_response=my_secure_session       |
| 115  | valid_srv_response=my_secure_session |                     | valid_srv_response=my_secure_session |
| 116  | iss_certificate=my_secure_session    |                     | iss_certificate=my_secure_session    |
| 117  | iss_key=my_secure_session            |                     | iss_key=my_secure_session            |
| 118  | iss_signature=my_secure_session      |                     | iss_signature=my_secure_session      |

| TIME | ALERTS | COMMS | CORRELATION                        | DATA MANAGEMENT             |
|------|--------|-------|------------------------------------|-----------------------------|
| 1    |        |       |                                    |                             |
| 2    |        |       |                                    |                             |
| 3    |        |       |                                    |                             |
| 4    |        |       |                                    |                             |
| 5    |        |       |                                    |                             |
| 6    |        |       |                                    |                             |
| 7    |        |       |                                    |                             |
| 8    |        |       |                                    |                             |
| 9    |        |       |                                    |                             |
| 10   |        |       | filter=tracks_l_want               |                             |
| 11   |        |       |                                    |                             |
| 12   |        |       | subscribe_tracks=tracks_l_want     |                             |
| 13   |        |       | subscribe_db_changes=tracks_l_want |                             |
| 14   |        |       |                                    |                             |
| 15   |        |       | track_db=tracks_l_want             |                             |
| 16   |        |       |                                    |                             |
| 17   |        |       |                                    | req_data_type=tracks_l_want |
| 18   |        |       |                                    | req_retr_rec=tracks_l_want  |
| 19   |        |       |                                    | req_retr_msg=tracks_l_want  |
| 20   |        |       |                                    | respond_msg=tracks_l_want   |
| 21   |        |       |                                    |                             |
| 22   |        |       |                                    |                             |
| 23   |        |       | record_db=tracks_l_want            |                             |
| 24   |        |       | valid_tracks=tracks_l_want         |                             |
| 25   |        |       | respond_valid_tracks=tracks_l_want |                             |
| 26   |        |       |                                    |                             |
| 27   |        |       |                                    |                             |
| 28   |        |       |                                    |                             |
| 29   |        |       |                                    |                             |
| 30   |        |       |                                    |                             |
| 31   |        |       |                                    |                             |
| 32   |        |       |                                    |                             |
| 33   |        |       |                                    |                             |
| 34   |        |       |                                    |                             |
| 35   |        |       |                                    |                             |
| 36   |        |       |                                    |                             |

SAAWC MESSAGE SCHEDULE

| TIME | ALERTS                       | COMMS                          | CORRELATION | DATA MANAGEMENT |
|------|------------------------------|--------------------------------|-------------|-----------------|
| 37   |                              |                                |             |                 |
| 38   |                              |                                |             |                 |
| 39   |                              |                                |             |                 |
| 40   |                              |                                |             |                 |
| 41   |                              |                                |             |                 |
| 42   |                              |                                |             |                 |
| 43   |                              |                                |             |                 |
| 44   |                              |                                |             |                 |
| 45   |                              |                                |             |                 |
| 46   |                              |                                |             |                 |
| 47   |                              |                                |             |                 |
| 48   | filter=alerts_1_want         |                                |             |                 |
| 49   | respond_alerts=alerts_1_want |                                |             |                 |
| 50   |                              |                                |             |                 |
| 51   |                              |                                |             |                 |
| 52   |                              |                                |             |                 |
| 53   |                              |                                |             |                 |
| 54   |                              |                                |             |                 |
| 55   |                              |                                |             |                 |
| 56   |                              |                                |             |                 |
| 57   |                              |                                |             |                 |
| 58   |                              |                                |             |                 |
| 59   |                              |                                |             |                 |
| 60   |                              |                                |             |                 |
| 61   |                              |                                |             |                 |
| 62   |                              |                                |             |                 |
| 63   |                              |                                |             |                 |
| 64   |                              |                                |             |                 |
| 65   |                              |                                |             |                 |
| 66   |                              | data=http_bits_for_adsd        |             |                 |
| 67   |                              | HTTP_in=http_bits_for_adsd     |             |                 |
| 68   |                              | HTTP_msg_in=http_bits_for_adsd |             |                 |
| 69   |                              |                                |             |                 |
| 70   |                              |                                |             |                 |
| 71   |                              |                                |             |                 |
| 72   |                              |                                |             |                 |

| TIME | ALERTS | COMMS | CORRELATION | DATA MANAGEMENT                    |
|------|--------|-------|-------------|------------------------------------|
| 73   |        |       |             |                                    |
| 74   |        |       |             |                                    |
| 75   |        |       |             |                                    |
| 76   |        |       |             |                                    |
| 77   |        |       |             |                                    |
| 78   |        |       |             |                                    |
| 79   |        |       |             |                                    |
| 80   |        |       |             |                                    |
| 81   |        |       |             |                                    |
| 82   |        |       |             |                                    |
| 83   |        |       |             |                                    |
| 84   |        |       |             |                                    |
| 85   |        |       |             |                                    |
| 86   |        |       |             |                                    |
| 87   |        |       |             |                                    |
| 88   |        |       |             | req_data_type=file_I_want_to_print |
| 89   |        |       |             | req_retr_file=file_I_want_to_print |
| 90   |        |       |             | file_del_db=file_I_want_to_print   |
| 91   |        |       |             |                                    |
| 92   |        |       |             | respond_msg=file_I_want_to_print   |
| 93   |        |       |             |                                    |
| 94   |        |       |             |                                    |
| 95   |        |       |             |                                    |
| 96   |        |       |             |                                    |
| 97   |        |       |             |                                    |
| 98   |        |       |             |                                    |
| 99   |        |       |             |                                    |
| 100  |        |       |             |                                    |
| 101  |        |       |             |                                    |
| 102  |        |       |             |                                    |
| 103  |        |       |             |                                    |
| 104  |        |       |             |                                    |
| 105  |        |       |             |                                    |
| 106  |        |       |             |                                    |
| 107  |        |       |             |                                    |
| 108  |        |       |             |                                    |

# SAAWC MESSAGE SCHEDULE

| TIME | ALERTS | COMMS | CORRELATION | DATA MANAGEMENT |
|------|--------|-------|-------------|-----------------|
| 109  |        |       |             |                 |
| 110  |        |       |             |                 |
| 111  |        |       |             |                 |
| 112  |        |       |             |                 |
| 113  |        |       |             |                 |
| 114  |        |       |             |                 |
| 115  |        |       |             |                 |
| 116  |        |       |             |                 |
| 117  |        |       |             |                 |
| 118  |        |       |             |                 |



| TIME | DEVICE | MAP | MESSAGE                           | NAME |
|------|--------|-----|-----------------------------------|------|
| 1    |        |     |                                   |      |
| 2    |        |     |                                   |      |
| 3    |        |     |                                   |      |
| 4    |        |     |                                   |      |
| 5    |        |     |                                   |      |
| 6    |        |     |                                   |      |
| 7    |        |     |                                   |      |
| 8    |        |     |                                   |      |
| 9    |        |     |                                   |      |
| 10   |        |     |                                   |      |
| 11   |        |     |                                   |      |
| 12   |        |     |                                   |      |
| 13   |        |     |                                   |      |
| 14   |        |     |                                   |      |
| 15   |        |     |                                   |      |
| 16   |        |     |                                   |      |
| 17   |        |     |                                   |      |
| 18   |        |     |                                   |      |
| 19   |        |     |                                   |      |
| 20   |        |     |                                   |      |
| 21   |        |     |                                   |      |
| 22   |        |     |                                   |      |
| 23   |        |     |                                   |      |
| 24   |        |     |                                   |      |
| 25   |        |     |                                   |      |
| 26   |        |     | manage_template=add_spot_rep_temp |      |
| 27   |        |     |                                   |      |
| 28   |        |     |                                   |      |
| 29   |        |     |                                   |      |
| 30   |        |     |                                   |      |
| 31   |        |     |                                   |      |
| 32   |        |     |                                   |      |
| 33   |        |     |                                   |      |
| 34   |        |     |                                   |      |
| 35   |        |     |                                   |      |
| 36   |        |     |                                   |      |

SAWVC MESSAGE SCHEDULE

| TIME | DEVICE | MAP                    | MESSAGE                          | NAME |
|------|--------|------------------------|----------------------------------|------|
| 37   |        |                        | manage_template=add_pos_rep_temp |      |
| 38   |        | deliver_map=map_l_want |                                  |      |
| 39   |        |                        |                                  |      |
| 40   |        |                        |                                  |      |
| 41   |        |                        |                                  |      |
| 42   |        |                        |                                  |      |
| 43   |        |                        |                                  |      |
| 44   |        |                        |                                  |      |
| 45   |        |                        |                                  |      |
| 46   |        |                        |                                  |      |
| 47   |        |                        |                                  |      |
| 48   |        |                        |                                  |      |
| 49   |        |                        |                                  |      |
| 50   |        |                        |                                  |      |
| 51   |        |                        |                                  |      |
| 52   |        |                        |                                  |      |
| 53   |        |                        |                                  |      |
| 54   |        |                        |                                  |      |
| 55   |        |                        |                                  |      |
| 56   |        |                        |                                  |      |
| 57   |        |                        |                                  |      |
| 58   |        |                        |                                  |      |
| 59   |        |                        | filter=msgsl_want                |      |
| 60   |        |                        | respond_msgs=msgsl_want          |      |
| 61   |        |                        |                                  |      |
| 62   |        |                        |                                  |      |
| 63   |        |                        |                                  |      |
| 64   |        |                        |                                  |      |
| 65   |        |                        |                                  |      |
| 66   |        |                        |                                  |      |
| 67   |        |                        |                                  |      |
| 68   |        |                        |                                  |      |
| 69   |        |                        |                                  |      |
| 70   |        |                        | message_db=http_bits_for_adsd    |      |
| 71   |        |                        |                                  |      |
| 72   |        |                        | respond_msgs=http_bits_for_adsd  |      |

| TIME | DEVICE                       | MAP | MESSAGE | NAME                                   |
|------|------------------------------|-----|---------|--|
| 73   |                              |     |         |  |
| 74   |                              |     |         |  |
| 75   |                              |     |         |  |
| 76   |                              |     |         |  |
| 77   | device_alive=new_cdrom_drive |     |         |  |
| 78   |                              |     |         |  |
| 79   |                              |     |         |  |
| 80   |                              |     |         |  |
| 81   |                              |     |         |  |
| 82   |                              |     |         |  |
| 83   |                              |     |         |  |
| 84   |                              |     |         | resource_phys_loc=file_I_want_to_print |
| 85   |                              |     |         |  |
| 86   |                              |     |         |  |
| 87   |                              |     |         |  |
| 88   |                              |     |         |  |
| 89   |                              |     |         |  |
| 90   |                              |     |         |  |
| 91   |                              |     |         |  |
| 92   |                              |     |         |  |
| 93   |                              |     |         |  |
| 94   |                              |     |         |  |
| 95   |                              |     |         |  |
| 96   |                              |     |         |  |
| 97   |                              |     |         |  |
| 98   |                              |     |         |  |
| 99   |                              |     |         |  |
| 100  |                              |     |         |  |
| 101  |                              |     |         |  |
| 102  |                              |     |         |  |
| 103  |                              |     |         |  |
| 104  |                              |     |         |  |
| 105  |                              |     |         |  |
| 106  |                              |     |         |  |
| 107  |                              |     |         |  |
| 108  |                              |     |         |  |

SAAWC MESSAGE SCHEDULE

| TIME | DEVICE | MAP | MESSAGE | NAME |
|------|--------|-----|---------|------|
| 109  |        |     |         |      |
| 110  |        |     |         |      |
| 111  |        |     |         |      |
| 112  |        |     |         |      |
| 113  |        |     |         |      |
| 114  |        |     |         |      |
| 115  |        |     |         |      |
| 116  |        |     |         |      |
| 117  |        |     |         |      |
| 118  |        |     |         |      |

| TIME | PRINT | SECURITY | TIME                  | TRACK                        |
|------|-------|----------|-----------------------|------------------------------|
| 1    |       |          | new_time=970519080801 |                              |
| 2    |       |          |                       |                              |
| 3    |       |          |                       |                              |
| 4    |       |          |                       |                              |
| 5    |       |          |                       |                              |
| 6    |       |          |                       |                              |
| 7    |       |          |                       |                              |
| 8    |       |          |                       | filter=tracks_l_want         |
| 9    |       |          |                       | respond_tracks=tracks_l_want |
| 10   |       |          |                       |                              |
| 11   |       |          | new_time=970519080811 |                              |
| 12   |       |          |                       |                              |
| 13   |       |          |                       |                              |
| 14   |       |          |                       |                              |
| 15   |       |          |                       |                              |
| 16   |       |          |                       |                              |
| 17   |       |          |                       |                              |
| 18   |       |          |                       |                              |
| 19   |       |          |                       |                              |
| 20   |       |          |                       |                              |
| 21   |       |          | new_time=970519080821 |                              |
| 22   |       |          |                       |                              |
| 23   |       |          |                       |                              |
| 24   |       |          |                       |                              |
| 25   |       |          |                       |                              |
| 26   |       |          |                       |                              |
| 27   |       |          |                       |                              |
| 28   |       |          |                       |                              |
| 29   |       |          |                       |                              |
| 30   |       |          |                       |                              |
| 31   |       |          | new_time=970519080831 |                              |
| 32   |       |          |                       |                              |
| 33   |       |          |                       |                              |
| 34   |       |          |                       |                              |
| 35   |       |          |                       |                              |
| 36   |       |          |                       |                              |

SAAWC MESSAGE SCHEDULE

| TIME | PRINT | SECURITY | TIME                  | TRACK |
|------|-------|----------|-----------------------|-------|
| 37   |       |          |                       |       |
| 38   |       |          |                       |       |
| 39   |       |          |                       |       |
| 40   |       |          |                       |       |
| 41   |       |          | new_time=970519080841 |       |
| 42   |       |          |                       |       |
| 43   |       |          |                       |       |
| 44   |       |          |                       |       |
| 45   |       |          |                       |       |
| 46   |       |          |                       |       |
| 47   |       |          |                       |       |
| 48   |       |          |                       |       |
| 49   |       |          |                       |       |
| 50   |       |          |                       |       |
| 51   |       |          | new_time=970519080851 |       |
| 52   |       |          |                       |       |
| 53   |       |          |                       |       |
| 54   |       |          |                       |       |
| 55   |       |          |                       |       |
| 56   |       |          |                       |       |
| 57   |       |          |                       |       |
| 58   |       |          |                       |       |
| 59   |       |          |                       |       |
| 60   |       |          |                       |       |
| 61   |       |          | new_time=970519080901 |       |
| 62   |       |          |                       |       |
| 63   |       |          |                       |       |
| 64   |       |          |                       |       |
| 65   |       |          |                       |       |
| 66   |       |          |                       |       |
| 67   |       |          |                       |       |
| 68   |       |          |                       |       |
| 69   |       |          |                       |       |
| 70   |       |          |                       |       |
| 71   |       |          | new_time=970519080911 |       |
| 72   |       |          |                       |       |

| TIME | PRINT                                | SECURITY | TIME                  | TRACK |
|------|--------------------------------------|----------|-----------------------|-------|
| 73   |                                      |          |                       |       |
| 74   |                                      |          |                       |       |
| 75   |                                      |          |                       |       |
| 76   |                                      |          |                       |       |
| 77   |                                      |          |                       |       |
| 78   |                                      |          |                       |       |
| 79   |                                      |          |                       |       |
| 80   |                                      |          |                       |       |
| 81   |                                      |          | new_time=970519080921 |       |
| 82   |                                      |          |                       |       |
| 83   |                                      |          |                       |       |
| 84   |                                      |          |                       |       |
| 85   |                                      |          |                       |       |
| 86   | request_file=file_I_want_to_print    |          |                       |       |
| 87   |                                      |          |                       |       |
| 88   |                                      |          |                       |       |
| 89   |                                      |          |                       |       |
| 90   |                                      |          |                       |       |
| 91   |                                      |          | new_time=970519080931 |       |
| 92   |                                      |          |                       |       |
| 93   |                                      |          |                       |       |
| 94   | file=file_I_want_to_print            |          |                       |       |
| 95   | data_stream=file_I_want_to_print     |          |                       |       |
| 96   | job_spooled_msg=file_I_want_to_print |          |                       |       |
| 97   |                                      |          |                       |       |
| 98   |                                      |          |                       |       |
| 99   |                                      |          |                       |       |
| 100  |                                      |          |                       |       |
| 101  |                                      |          | new_time=970519080941 |       |
| 102  |                                      |          |                       |       |
| 103  |                                      |          |                       |       |
| 104  |                                      |          |                       |       |
| 105  |                                      |          |                       |       |
| 106  |                                      |          |                       |       |
| 107  |                                      |          |                       |       |
| 108  |                                      |          |                       |       |

SAWC MESSAGE SCHEDULE

| TIME | PRINT | SECURITY                            | TIME                  | TRACK |
|------|-------|-------------------------------------|-----------------------|-------|
| 109  |       |                                     |                       |       |
| 110  |       | issue_certificate=my_secure_session |                       |       |
| 111  |       |                                     | new_time=970519080951 |       |
| 112  |       | issue_key=my_secure_session         |                       |       |
| 113  |       | issue_signature=my_secure_session   |                       |       |
| 114  |       |                                     |                       |       |
| 115  |       |                                     |                       |       |
| 116  |       |                                     |                       |       |
| 117  |       |                                     |                       |       |
| 118  |       |                                     |                       |       |





## **APPENDIX C**

### **ISSUES AND TECHNOLOGIES PERTAINING TO THE DEVELOPMENT OF TRUSTED PATHS IN A DISTRIBUTED HETEROGENEOUS NETWORK**

A computing architecture which has come under increasing scrutiny within the computing industry in recent years is that of the three-tier architecture, based on the concept of separating business rules functionality from computational service functionality. Computational services might include infrastructure services such as communication services, data management services, or security services, or they might include common support application services such as correlation services and message processing services. [BUTLER96] proposes for the Department of Defense's (DOD) Global Command Control System (GCCS) a three-tier architecture in which a middle tier acts as a "broker", instantiating client and server "threads" of execution upon requests from clients to "subscribe" to specific services. The broker is responsible for determining not only the appropriateness of client and server subscriptions but also the relative priority of each request. This proposed architecture provides a potential solution to the difficult problem of discriminating between the real-time packet requirements and the non-real-time packet requirements of clients and servers communicating across a single, general purpose network. Though it doesn't describe the protocol for implementing the broker adjudication mechanism, it does identify a separate place for that functionality to reside, simplifying the implementation of both the client and the server functionality by isolating them from the complexity of resolving communication session priorities. For these reasons alone the three-tier architecture is becoming an attractive alternative, not only within the DOD, but also to private sector businesses currently operating within a traditional two-tier client/server architecture.

The nature of this computing architecture, however, is by default, distributed. It is also anticipated that many three-tier implementations would be composed of widely varying computing

platforms, due to the economic pressures associated with leveraging investments in legacy systems and the scaled upgrading of individual systems within a network architecture. The combination of distributed computing and heterogeneous platforms within a three-tier architecture, however, poses a significant challenge to the development of secure computing mechanisms which can provide the degree of trust required by locally developed security policies. In order to meet this challenge, new security technologies designed for inter-network environments, and new methods for implementing legacy security technologies must be investigated as alternatives to the numerous proprietary intra-network security mechanisms in widespread practice today.

From [CSC97], the following scenario provides motivation for why a typical GCCS operator might require the use of a trusted path between platforms and across a distributed processing, heterogeneous network in the course of conducting an operational task:

"...The user inserts his or her Fortezza card into the work station card reader, authenticates against the card and then downloads an Applet and begins its execution. The Applet communicates with a server using either CORBA method invocations or DCE remote procedure calls. The Applet and/or the server with which it is communicating specify via CORBA/DCE APIs the amount and type of security to invoke: authenticate the user (or the application server), verify that transmitted data has not been modified, completely encrypt all communication, etc. CORBA or DCE, in turn, utilizes the Fortezza and X.500 APIs to perform the user authentication, encryption, etc. Thus, Java builds its interprocess communication on top of either CORBA or DCE, which in turn builds its security on top of Fortezza and X.500."

From the preceding paragraph one can infer a strong commitment on behalf of the DOD's Defense Information Systems Agency (DISA) toward two trends: distributed computing in a

heterogeneous environment, and the use of legacy security mechanisms to implement local security policies. [CSC97] describes the four cornerstones of a distributed security infrastructure for the network-centric GCCS: Fortezza, X.500, CORBA, DCE. Fortezza is a standard for public/private key cryptography and is available as a PC card implementation for those platforms supporting this mechanism. X.500 is an International Standards Organization (ISO) standard which specifies a global, hierarchical name service implemented as a distributed database accessible via Lightweight Directory Access Protocol (LDAP) clients or by applications using the X.500 client APIs. Entries contained within an X.500 directory are treated as objects, fully configurable and consisting of a collection of attributes. In the GCCS infrastructure, X.500 will serve two purposes: as the repository for public key storage in the Fortezza scheme, and as a white pages for the Defense Message System (DMS), the DOD's projected replacement for the legacy AUTODIN messaging system. The Object Management Group's (OMG) Common Object Request Broker Architecture (CORBA) is a proposed architecture for the creation and interaction of distributed objects, and the Distributed Computing Environment (DCE) is a comparable architecture standard proposed by the Open Software Foundation (OSF). A deliberate investigation into the complexity of trusted paths, and the mechanisms required to realize them, illustrates why the previously described technologies are just a few of many potential solutions to the problem of secure computing in a distributed, heterogeneous environment.

The fundamental requirement for two processes to communicate securely in a computing environment is encapsulated in the concept of a trusted path. At the simplest level, a process currently running in the Central Processing Unit (CPU) might communicate directly with a

process driving an Input/Output device, such as a keyboard or harddrive, via an interrupt-driven data transfer mechanism known as a bus, or with another embedded processor such as might be found on a video card or modem. At the most complex level, communicating processes might be executing on physically distinct machines separated by thousands of miles and subjected to the protocol packaging and unpackaging of network processors responsible for routing data between the two processes. The establishment of a trusted path between two communicating processes certainly becomes more difficult to achieve as the number of required cooperating and assisting processes responsible for that communication increases. Intuitively, it becomes much more of a challenge to anticipate the numerous "portals" for attacking data transiting over miles and between machines than it is to plan for the protection of data transiting over inches and within the confines of a single machine. And yet the computing patterns of today point to an ever-increasing need to connect more computing machines together via networks and inter-networks that are increasingly subject to malicious attacks. In order to combat these attacks, current trends in computing point toward the use of computer-derived manifestations of long trusted human mechanisms, such as trusted paths and secure domains of operation, through the use of certificates of trust, encryption of data, and signatures as the means for guaranteeing, respectively, authenticity, secrecy, and integrity of the data transiting between two communicating processes.

Demonstrating a mechanism for the establishment of a local trusted path, the [GARFINKEL96] text describes a procedure between the operating system and the login program which is invoked via signals from the keyboard receiving its input from the human operator. Specifically, the operating system employs a mechanism to kill all running processes upon receipt

of a particular signal from the keyboard. This policy ensures that the only running processes are those legitimate processes associated with the real operating system. What makes this type of trusted path mechanism possible is the presence of both a direct path between devices and a proprietary addressing scheme, i.e., MCA, ISA, IRQ, etc., to foil the attempt of any malicious process attempting to masquerade as a legitimate process.

But establishing direct and trusted paths between processes identified by non-standard, close-ended addressing schemes, such as the mentioned bus schemes, is neither practical nor even interesting, given the scale in which people expect to compute and communicate today. In order to close the physical distance between human and computing activities we've achieved the affect of logical collocation through the implementation of standardized datalink, network, and inter-network-level computing protocols. And though we've significantly complicated the task of establishing trusted paths between communicating processes, our need for trusted paths has only increased: the speed at which we've connected together our computing devices is exceeded only by the speed at which we've devised ways to automate so many human activities. Further complicating the task of creating and sustaining trusted paths is the shift in thinking about the ways in which we program: from procedural to object-oriented, from writing code to automate the conduct of a transaction to writing code which simulates two or more transacting objects. So not only are we concerned with guaranteeing the authenticity, secrecy, and integrity of transiting data, but also with programming transiting binary globs of intelligence which can alter the way in which our two (or more) processes are communicating to more closely mirror the real world events we seek to automate. But if the future of computing points toward an ever-increasing

need to communicate over inter-networks, as client objects, server objects, and middle-tier broker objects, and within the new paradigm of object-oriented programming which shifts focus from programming the procedural to programming the behavior and the interactions of objects, then we need to identify the means with which we can provide the authenticity, secrecy, and integrity that communicating processes require to establish a trusted path in this new environment. Perhaps the widely endorsed, object-oriented standard middleware architecture, CORBA, and the rapidly growing, object-oriented programming language, Java, are the best tools currently available to developers to achieve those means. Furthermore, there exist projects, such as Trusted Information Systems' (TIS) SIGMA, which have examined the capabilities of these development and runtime environments and derived potential solutions to the problem of trusted communication between objects over an inter-network.

There are two principal advantages to the developer using Java and CORBA tools together to develop for a distributed, heterogeneous computing environment composed of an array of different computer architectures, operating systems, and network protocols. The CORBA specification provides an environment and a standard for writing and reading object interfaces. These allow the user to preserve his investment in legacy code by "wrapping" these legacy "objects" in a standard Interface Definition Language (IDL) interface, which is then propagated across the Object Request Broker, or "ORB" bus, so that client objects can recognize and invoke the published methods of the server objects. The Java standard, on the other hand, provides a tool with which the developer can create, in any Java development environment, the implementation for either the client or server objects, or both, with the result that the compiled



Java "bytecode" is portable across any computing platform running the language standard Java Virtual Machine (JVM). This makes it an attractive alternative to writing and compiling the same objects on each of many desired platforms. What is compelling about the capabilities inherent in these two software development standards is that users can take advantage of existing legacy authentication mechanisms such as Kerberos servers and encryption mechanisms such as Fortezza and concentrate on building secure clients and middle-tier brokers guaranteed to run on any platform running a JVM. [ORFALI97] describes CORBA as bringing to distributed computing "network transparency" while Java brings to heterogeneous computing "implementation transparency."

A CORBA/Java architecture is designed to provide the infrastructure for moving objects across a Transmission Control Protocol/Internet Protocol (TCP/IP) network and for enabling communication between those objects. It is proposed as an alternative architecture to that provided by existing TCP/IP distributed processing protocols such as Common Gateway Interface/HyperText Transfer Protocol (CGI/HTTP), JavaSoft's Remote Method Invocation (RMI), and Microsoft's Distributed Component Object Model (DCOM). The CGI/HTTP architecture is currently the most popular model for providing the means for portable clients (generally a JVM running in a Web Browser) to access data from legacy database servers. While this functionality provides a significant leap over previous proprietary architectures for client/server distributed computing, it does not address the need to build client and server objects which can determine requirements and request services dynamically, at runtime. RMI and DCOM, on the other hand, do provide the architecture for distributed computing with objects.

However, they are proprietary solutions with acceptance limited to specific targeted communities. CORBA is the standard developed by the OMG which has been embraced by over 700 computing industry companies. Likewise, the Java language is being widely embraced for its highly recognizable syntax (C, C++ like), its strong software engineering attributes (Ada95 like), its strong object-oriented nature (Smalltalk like), and its support for key distributed object-oriented computing concepts such as multiple threads of execution and its built-in networking Application Programming Interfaces (APIs). Finally, a key component of the CORBA/Java architecture is the increasing acceptance and deployment in commercial products of the Internet Inter-ORB Protocol (IIOP), a principal TCP/IP protocol standard for managing communication between objects and different ORBs on a TCP/IP network, discussed in greater detail later.

The CORBA specification is purposefully neutral with regard to the programming language of choice for the implementation of security policy objects, or other CORBA objects for that matter. Java is a leading candidate for several reasons: the Java language specification brings to the table a set of language-specific mechanisms for achieving object-oriented programming, multi-threaded performance, and dynamic deallocation of memory no longer in use; it also brings a runtime environment with specific rules for trusted access to system resources. Given the growing popularity of the JVM runtime environment as a host environment for the execution of network distributed mobile code, and anticipating a day when JVM-hosted applets might be performing the preponderance of computation at the client level, an investigation into the security policy and mechanisms of the JVM is highly relevant. Because even the most robust authentication mechanisms, encryption algorithms, and integrity-checking schemes are trivial

obstacles to a malicious individual with the capability to manipulate the runtime environment itself.

The JVM presents a seemingly uniform interface to the Java programmer which permits him to concentrate on writing classes which may invoke (and assume the automatic invocation) of the targeted JVM security mechanisms, regardless of the platform that JVM is running on. In reality, however, each JVM is in fact, platform-specific. JVM vendors are given great leeway to pick, choose, and implement the type and degree of security mechanisms identified in the JVM specification. This flexibility allows for Applet viewers (JVMs) to be written for inherently more trusted environments, such as a corporate intranet or secure Local Area Network (LAN), as well as for untrusted environments, such as a general-purpose, commercially distributed Web browser might be used in. The specification identifies two layers of defense: the first is a mechanism for generating and validating digital signatures; the second is a policy, the "sandbox," which defines the system resources which are within and off-limits to the executable mobile code. Applets with validated signatures are permitted the same execution privileges as locally stored application code. Locally stored application code, though not guaranteed to be free of malicious code, is assumed to be; the reality being that any executable code, regardless of origin, must ultimately be given the green light or rejected by a user at some point in time, based upon local procedures for obtaining and loading that code to local storage. The JVM uses three mechanisms to implement its sandbox policy: the Bytecode Verifier, the Class Loader, and the Security Manager. [FLANAGAN96] lists the following privileges unavailable to an unauthorized Applet: reads, writes, deletions, and renaming of files; creating, removing, and viewing directories; searching for a file or reading a

file's attributes; creating network connections to any computer other than the originating host; listening for or accepting network connections on any local ports; creating a top-level window without indicating that the window is "untrusted"; obtaining current user name or home directory; defining system properties; running other programs locally; causing the Java Interpreter to exit; loading dynamic libraries locally; creating or manipulating threads that are not part of the Applet's ThreadGroup; manipulating any ThreadGroup other than its own; creating a ClassLoader or Security Manager object; specifying network control classes; accessing or loading classes in any package not in the standard API eight; or defining classes that are part of packages on the local system.

The first of the JVM security mechanisms, the Bytecode Verifier, has the responsibility for checking downloaded executable code for namespace or type conversion violations. [FLANAGAN96] notes that the Bytecode Verifier ensures that the code is valid JVM code, neither overflows nor underflows the stack, does not use registers incorrectly, and does not convert data types illegally. The principle concern for the Bytecode Verifier is that malicious code might forge pointers or use memory arithmetic to escape the "sandbox" and gain access to regions of memory assigned to other applications or to the operating system. An additional concern to the Bytecode Verifier is that malicious code might cause the Java Interpreter to become unstable and take advantage of resulting or previously existing security holes. The responsibility of the ClassLoader is to dictate the runtime environment by installing each Applet in its own namespace and by prohibiting Applets from seeing and referencing classes from outside of its namespace. This denies a malicious Applet the opportunity to replace the Java API class

libraries with its own versions. Finally, the Java Security Manager mechanism consists of a collection of mechanisms, or methods, which can be used by the system to verify whether or not certain operations are allowed in the current runtime environment. It is the Security Manager object instantiated by a particular Applet viewer which enforces the security policy specified by that JVM.

Though the Java language specification is inherently network and distributed computing oriented, it still must rely upon some lower level protocol to enable the movement of those distributed objects. Distributed computing which could be achieved on a large-scale and in a non-proprietary fashion arrived in the mid-1980s with the work of Sun Microsystems and UC Berkeley on the Remote Procedure Call (RPC) protocol. This established a mechanism for allowing a process to invoke the computational functionality of a remote machine across a TCP/IP network. The principle advantage that invoking object methods via a CORBA ORB has over more traditional methods of invoking functions across a network, such as RPC, is that, with RPC, the called function has no state. The calling object is invoking a statically determined function with statically determined data sets. With CORBA, on the other hand, the calling object is invoking a specific function (method) of an object which has state, and the results of the call are dependent upon the dynamically determined condition of the called object's data sets (attributes) at the time of the call. In other words, the polymorphic behavior that we have come to expect in local computations in programs written in languages which support that behavior, can now be realized across a network in a distributed, heterogeneous computing environment. Specifically, [ORFAL197] describes how a CORBA ORB provides for either the statically defined or the

dynamically discovered invocation of remote object methods, language-neutral data types, runtime tables of data (metadata) which allow client objects to dynamically discover the methods of server objects, and transparency to the programmer with regard to issues of transport, client and server location, object activation, and byte ordering.

In addition to the ORB, which dictates the mechanism for invoking the methods of remote objects, the most recently adopted CORBA specification, CORBA 2.0 approved in 1995, defines a set of 16 CORBA system-level services which define the means for creating, naming, copying, moving, deleting, registering, locking, relating, and publishing objects and information about those objects. These services also include rules for committing on transactions between objects, a superset of Structured Query Language (SQL) operations to support access to Database Management Systems (DBMS), a licensing service to support fair and mediated access to certain objects, a time service to synchronize interactions between objects, and a security service, defined below in greater detail, which specifies rules for authentication, access control lists, confidentiality, and non-repudiation. [ORFALI97] describes the advantages of developing in a CORBA environment by using the example of developing a car. The developer can create a car "component" by inheriting concurrency, persistence, and transaction awareness from the defined CORBA services. Similarly, a developer could create security policy objects which simplify the means by which security policy is created, published, and enforced across a heterogeneous network.

The CORBA security environment defined in the CORBA 2.0 specification describes a security model and architecture, and it leaves the selection of security mechanisms to apply to that

model up to the implementor. Possible mechanisms for employment in a CORBA security model include Kerberos, Secure RPC, and Secure European System for Applications in a Multivendor Environment (SESAME). The principle motive of the people responsible for developing this specification was to decouple the implementation of security mechanisms from the implementation of client and server processes and applications. In other words, developers would be free to implement security mechanisms into their client and server objects, but could also expect to receive the protections offered by authentication, access controls, encryption, signing, and auditing which can be designed into the ORB itself by the ORB vendors. As a means to achieving these security protections, it is the intention of the specification authors that developers of CORBA security mechanisms will provide for a Credentials object, created when a user logs in or a process is invoked, which will contain the user's/processes' privileges regarding roles, groups, and security clearance. Objects then invoked by the ORB will access the Credentials object as a first step in determining the identity and privileges of the invoking object.

A recurring theme in the discussions of secure computing within a heterogeneous, distributed computing architecture is the notion of a trusted intra-network, or secure domain. In their SIGMA project, TIS speaks of these domains as "enclaves." The project managers selected the term enclave to describe a network environment which retains interoperability with other networks but is nevertheless protected from those outside networks through locally established security policies. The [GARFINKEL96] text presumes that the nature of trust within the enclaves themselves is assured through traditional measures such as good hiring practices, good account administration, good password assignment, and good physical security of the local area network.

For this reason the text is primarily devoted to the discussion of inter-network security. In military computing, where existing personnel and weaponry form a strong barrier to potential physical threats to a network, and where a rigid policy regarding the recruitment of candidates and the training of operators forms a significant first layer of defense, we make the same assumptions regarding the security of our own enclaves with the result that we, too, are increasingly concerned with the inter-enclave threats against which our enclaves are most vulnerable. [GARFINKEL96] describes in great detail the policies and mechanisms available to protect these trusted enclaves from networks external to them through a combination of chokes and gateways which, when properly configured, constitute a firewall; as well as through simpler, process-independent mechanisms such as wrappers. Both of these constitute aggressive mechanisms for the rigid filtering of suspicious IP packets and for the use of proxy processes which handle internal and external requests for service. But current firewall mechanisms are incapable of completely addressing the complex security needs of objects which are interacting across the inter-network. It is the interconnection between these trusted and untrusted enclaves, the gateway and the policies and mechanisms which compose the gateway, which is the target of efforts to combat threats to the network and is the focus of effort in the SIGMA project.

TIS's SIGMA project is a research effort developed to investigate and prototype a collection of security mechanisms which implement domain-specific security policies between trusted and untrusted systems across a heterogeneous distributed computing environment based on CORBA interoperability. From "<http://www.tis.com/docs/research/distributed/sigma.html>", the purpose of SIGMA is threefold:



Develop security mechanisms for protecting an enclave by controlling access by other enclaves with which it interoperates.

Improve the state of the art of security mechanisms for object-oriented distributed systems.

Extend interoperability access controls to apply to heterogeneous security mechanisms and disparate policies of different enclaves.

The SIGMA project recognizes and addresses the need for communication between three distinct enclave types: a Multi-Level System (MLS) enclave in which information is controlled by strong label-based separation mechanisms; a Domain and Type Enforcement (DTE) enclave in which information is subject to complex role-based policies; and a Commercial Off The Shelf (COTS) enclave, in which information is subject to unknown or untrusted security policies. The project further recognizes that even among like enclave types, there will be differences in security policies, security mechanisms, and levels of assurance. [BENZEL96] documents an analysis of security policies and mechanisms in the current CORBA security specification and concludes the following topics are not adequately addressed: required security functionality for interoperability between enclaves and high assurance mechanisms for interoperability within enclaves.

[BENZEL96] identifies one significant obstacle facing the CORBA security object developer as being the large-scale deficiency in common commercially sold Operating Systems to guarantee that developed security components cannot be bypassed or tampered with. Contributing to this concern, the authors of the study have concluded that, due to performance concerns, ORB implementations largely consist of library modules residing in the same process address space as the client and server object processes they are designed to support. This

prevents the establishment of independent security mechanisms which can run, monitor, and interrupt questionable transactions.

As mentioned previously, the question of inter-enclave security is one which can be considered outside of the context of the given security policies and mechanisms of the enclave itself. The authors in [BENZEL96] stress that the single point of control for a network that is the network gateway is not so much a design strategy as much as a consequence of network architecture. This consequence presents an opportunity for the network security planner to perhaps compensate for the security weaknesses inherent in his deployed Operating Systems: whatever high-assurance security mechanisms may be absent in local OS's can be deployed at the network gateway in the form of choke mechanisms which provide IP packet-level monitoring and discarding, and in the form of gate mechanisms which provide proxy applications for accomplishing remote processing. Any security mechanisms implemented at the OS, application, or ORB level within the enclave only complement those established at the network gateway and constitute part of a "defense in depth" security policy and a prudent means for dictating the practice of secure computing within the enclave.

In SIGMA project terminology, the single point of access control for the network in question is called the ORB Gateway. Like a network firewall, the ORB Gateway consists of a set of security mechanisms which examine incoming and outgoing data to determine its compliance with the network security policy. Unlike a firewall, though, the ORB Gateway performs its functions by interrogating, authenticating, and validating objects and object requests before permitting their movement into and out of the enclave. The methodology for implementing the

ORB Gateway security mechanisms is the concept of DTE. It is through the distinct DTE signature of each application service, method, object, object attribute, and invoking object attribute that the security mechanisms of the ORB Gateway are able to establish the degree of trust specified by the network security policy.

A principle concern of CORBA ORB and CORBA object developers, and of the SIGMA project, is the movement of objects, security-related or otherwise, through that single point of access and across the distributed, heterogeneous network. In an environment in which competing, distributed, object-oriented computing paradigms abound, there is a requirement for a TCP/IP-based protocol which enables communication between objects managed by different ORBs. That protocol is the Internet Inter-ORB Protocol (IIOP), and it represents the common language between different ORBs which permits one ORB to correctly interpret the requests and responses of another, dissimilar ORB. IIOP makes the assumption that it is using a connection-oriented TCP session and it specifies to each ORB the acceptable data representation and message formatting. This is accomplished through Common Data Representation (CDR) coding, which defines a coding for all Interface Definition Language (IDL) data types, including primitive types, structured types, and object references. However, since most current firewalls do not support the capability to identify and service IIOP packets, the SIGMA project seeks to configure a traditional network firewall which sends IIOP packets to an ORB Gateway configured to handle only IIOP traffic. Incorporating a firewall feature known as a "plug", the firewall can be configured to forward to the ORB Gateway all IIOP traffic received on a particular TCP port. An additional reason for isolating IIOP packet processing from the network firewall is the complexity

of that processing, which contradicts the goal of incorporating small, simple, well-documented functionality within the firewall to filter out suspicious data packets.

[BENZEL96] identifies three forms of restriction performed by the ORB Gateway which demonstrate how an ORB Gateway matches and exceeds the capability for secure distributed computing that is provided by traditional firewalls. The first restriction is on the enclave-resident CORBA-based application services available to outside users. The CORBA model provides for both the static and dynamic discovery of application services through the publishing of interface definitions in a common IDL. The ORB Gateway will be configured with information pertaining to the enclave application services, including which services are accessible to outside users and over which communication ports those services may be requested. The second restriction is on the specific methods which can be invoked by an outsider; perhaps a subset of those methods offered by the CORBA server object. Reasons for restricting access to certain methods might be to provide read-only or write-only access to a particular server object in order to dictate in what way client objects may and may not alter the state of the server object. The enforcement of method restriction is controlled by the composition of a configuration list of methods used by the ORB Gateway to implement the enclave security policy. A third restriction encapsulates what is unique about CORBA and object-oriented programming: the restriction of specific objects to requesting objects without regard to the presence or absence of restrictions specified for access to methods or services as mentioned above.

[BENZEL96] identifies two approaches for an ORB Gateway using authentication data to restrict outside access to enclave CORBA objects. In the first approach, access checks are

performed by the ORB Gateway based upon a reconciliation between the contents of locally held configuration data and the object request message data. Authentication of the object request is handled internally, allowing the security administrator to develop separate and distinct security policies regarding access control for users within and outside of his enclave. In the second approach, access checks are not performed. Instead, the authentication mechanisms and data of the foreign enclave are translated into the comparable authentication mechanisms and data of the local enclave. With the bundled authentication data, or "credentials", the object request can be passed into the enclave where the ORB can make the appropriate access control decisions just as if the request had been initiated from within the enclave itself. This approach has the advantage that all access control decisions to an enclave object can be made at a central point, perhaps simplifying the administration of mechanisms such as access control lists.

Together, the Java language specification, the CORBA specification, and TIS's SIGMA project represent three new technologies which can significantly enhance the establishment of the trusted paths between communicating processes which GCCS operators require in a distributed, heterogeneous network. TIS's approach to establishing trusted paths between enclaves of computer networks is noteworthy for two reasons: its recognition that objects present the most promising method for encapsulating the security credentials of a given person or process, and its adherence to an open architecture which permits interoperability between competing ORB implementations and between enclaves with significantly varying internal security policies. The CORBA standard provides a framework both for supporting the interoperability between different proprietary object implementations and for defining an environment in which legacy

implementations can interact with fully object-oriented implementations. Finally, the Java language specification provides the basis for multi-threaded processing, platform-independent Graphical User Interface (GUI) construction, and built-in support for inter-networking which permits development of the security mechanisms prescribed by CORBA and SIGMA and are necessary for the establishment of trusted paths between users and processes in a distributed, heterogeneous computing environment.



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